THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., SEPTEMBER 12, 1889.

THE WEEK IN IRON CIRCLES.

General Features.

The attention of all is much attracted to foreign markets, these days, and our readers will be interested in learning from our English correrpondents, Messrs. S. W. Royse & Co., of Manchester, that prices of pig iron continue to improve, being about 1s. 6d. per ton higher at Middlesbrough, and about 1. 2d. per ton higher at Glasgow than at the commencement of August. The favorable condition of the iron market at leading trade centers in the Central and Southwest continues. At Chicago the feeling of strength in the iron market gains daily. The run of orders is continuous and widely distributed; no large transactions, however, are reported. Southern irons cut but little figure, being held higher than home brands, and being salable in other markets, at figures asked. There is a somewhat stronger feeling in Lake Superior charcoal, but sales are limited. Ohio softeners are in good request in small quantities. The transactions in pig iron, at Pittsburgh, during August, were probably the heaviest that have ever taken place in that market in a single month. It is not strange, therefore, that there should be less activity now, as consumers are well supplied for some time to come. The market is strong and prices are firmly maintained at the highest point reached. The past week at Detroit, owing to continued heavy demands, has shown a degree of sensitiveness in the market which is most satisfactory to the seller. Messrs. W. F. Jarvis & Co. report that several lots of Southern forge iron have been bought at full market quotations. Ohio irons have also remained firm, and Lake Superior charcoal has proven even more scarce than was at first supposed. Several furnaces are totally unable to furnish pig iron for delivery prior to the close of navigation, and buyers, depending on their regular grades, who have delayed purchasing, find themselves in some cases obliged to make substitution of other brands. Lake freights have advanced somewhat; canal rates are high, and consumers are paying to-day, even, a higher price than iron could have been delivered at a week ago. It is a steady progression in the right direction. A number of fair-sized orders have been placed at Louisville during the past week, both for present and future delivery. The market is firm and appears to be hardening. Some of the leading Southern companies are practically out of the market for several months, while others have blown their furnaces out for repairs. The railroads have given notice of a sharp advance in freights to some points north of the Ohio river, and prices will be advanced correspondingly. From Buffalo comes the same encouraging report. Demand for pig iron has been stronger this week than last, and a slow hardening in values continues. The successful starting of the Tonawanda furnace has rather centered the fire of competition on Buffalo, with the effect of making the prices relatively lower there than elsewhere. Grey forge has sold in the Mahoning Valley at $15 cash, at the furnace, equal to $16.20 at Buffalo, on the new freight rates. The same grade can be had nearly as low at Buffalo as at valley furnaces. Local car works and foundries have received liberal additional orders and are covering for their requirements. The general features of the market at St. Louis are unchanged. Sellers are firm with moderate offerings and buyers are supplying their needs, without any trouble, at current prices. The encouraging features of the market spoken of in late reports from Cincinnati have continued during the week past. At the close of the week the inquiry was heavier than at the beginning, and amounted to a good deal more in the aggregate, than furnaces in the South are able to meet. This is particularly true of No. 3 foundry and grey forge, on which grades most furnaces are heavily oversold. In No. 1 and No. 2 foundry, demand and supply are about evenly balanced. For charcoal iron and Ohio softeners the demand is slowly improving, but it does not keep pace with that of the grades named.

Iron Ore.

The advance in vessel freights announced last week has spread, and charters now go at $1.40 from the head of Lake Superior, $1.20 from Marquette, and $1.00 to $1.05 from Escanaba; and as about two fifths of this season's output is yet to come down, some people who had no confidence in the market will be pinched. By far the largest portion of the fleet, however, is chartered for the season, and the advance will affect the trade only in spots, here and there. Strange to say, there is also quite a strong inquiry for standard ores, by furnace-men who bought sparingly when the season opened, and who see in the present prices of pig metal a justification for paying the added lake freights. Coke, which now sells at $1.35, is expected to advance to $1.50 by October 1 and to $1.75 by November 1, so that the primary conditions for putting up the price of pig iron appear in the light of necessities rather than of inducements. Lake Superior ore is being rushed down to Lake Erie ports in unprecedented volume, and shipments continue as heavy as ever.

Pig Iron.

If the prices demanded by and in some instances conceded to the furnace-men form any basis for fixing quotations, the record of the week shows a material advance all along the line, averaging all the way from fifty cents to a dollar per ton. A sale of 500 tons of Bessemer is reported at $17.75 at Sharon, which makes the Cleveland price $18.40. One of the largest furnace concerns located in the valley quotes its foundry iron at $17 for No. 1 and $16 for No. 2, cash at the furnace, while asking $18 and $17 respectively under the same conditions of sale for November and later delivery. Another firm reports an inquiry for 50 tons of No. 1 foundry; having none for sale, No. 2 was offered on a basis of $16 cash at the furnace, whereupon the purchaser telegraphed an order for one hundred tons at that figure. The advance is in some measure due to the increased cost of production, the valley furnaces having advanced the price of labor 10 per cent. on September 1. The furnaces are largely sold up, and while stocks are decreasing, consumption is rapidly and steadily increasing. Bessemer iron, it is said, will sell at $20 inside of ninety days, and a betterment is looked for as to other grades of iron by that time. While there is no indication of a boom and while iron men, indeed, would deprecate such a thing, the fact remains that the healthy and active demand has given rise to a legitimate advance that is much needed to make up for the severe losses of a long and disastrously dull season.

Merchant Iron.

For some unaccountable reason the advance in the pig iron market has not as yet had a marked effect upon the prices of bar iron, and that article is being sold at from $33 to $34 a ton, with muck bar at $29. That there is not much money in these prices with old material rapidly advancing, is quite plain, and yet the long-hoped-for advance seems still as far off as ever. There is, however, great dearth of black sheets, and holders may command almost any price, owing to the very small stock from which to supply a large and increasing trade.

Scrap Iron.

In sympathy with the general upward movement, old American rails have gone up to $25.50, at which figure a 400-ton sale is reported. Wrought iron scraps of good quality brings $20 and steel crop ends from $17 to $18.

Hardware.

Inquiry for contractors' supplies and light shelf-goods is very good, and trade in other departments is quite fair. Cut nails being $1.85 at the mill.

AN EXPOSITION FOR CLEVELAND.

The question of an exposition is now fairly before the public, in the form of a report submitted to the Board of Industry, at its meeting last Saturday. In the judgment of the committee, and of the Board, the time has come when Cleveland should have an exposition, and the opinion seems unanimous that "there is no place in the Union, of the size of Cleveland, which combines greater advantages necessary to the success of such an undertaking." The Board did wisely in deciding to send the committee to Detroit and Pittsburgh to investigate further and report more fully at a subsequent meeting. That an exposition, judiciously managed, will pay, both directly and indirectly, there is no doubt. In proof of this we submit herewith more recent comments of contemporaries as to the expositions at St. Louis, Chicago and Toronto. Of the St. Louis exposition the *Age of Steel*, of September 7, says:

The St. Louis Exposition entered upon its sixth year Wednesday evening last, when the doors were opened for an admission period of forty days, exclusive of Sundays. The Exposition has now become a seemingly permanent institution of the city, just as has the great fact to which 125,000 people have been attracted in a single day. Its financial exhibit best illustrates how the enterprise has prospered, through skillful management and the substantial and appreciative regard of the citizens of St. Louis and tributary territory. In 1884, the opening year of the Exposition, the total receipts were $92,231; the next year they were $106,786; in 1886 $124,345; in 1887, $126,914; and last year they were but little less than in 1887, although a Presidential election was in progress and general business was tending rapidly to dullness. This record of success contrasts sharply with the experience of other cities in conducting expositions, for failure after one or two seasons has been the common lot in variably elsewhere. The exception in the case of St. Louis has undoubtedly been due, in the first place, to the progressive and liberal ideas of the exposition managers, who have secured costly attractions—for instance, in the department of music, Gilmore's great band each season—and yet have kept the price of admission to all parts of the Exposition down to the modest proportions of a 25-cent piece.

Concerning the Chicago Exposition, the *American Artisan* (September 7) says:

Chicago will surely hold the Fair of '92. She has given a thousand proofs of her surpassing competency for it. Not the least of these is her conspicuous success during the past sixteen years in maintaining the Interstate Exposition. The structure she has devoted to it is one of her pet institutions, and there is probably no other building in the land, save the capitol at Washington, that has been seen by so many strangers from all parts of the world. Every year of the period named, when "'twas in the mild September," Chicago has renewed in it her grand industrial displays, blending them with art and music, so as to charm as well as instruct, until the people of Illinois and the neighboring States have come to consider this show as the term of their Summer holiday. Meanwhile, it has never stood still. The art displays have grown both in magnitude and fascination with each succeeding year. The daily orchestral performance and occasional special concerts have made the building by the lake shore, a shrine for lovers of music. There is a new lesson or enjoyment to be found every day, and in every feature of its programme. It is a treat to the artisan and millionaire alike, while the noble city without offers scores of other attractions which a visitor can enjoy without extortion or discomfort.

Toronto has a very attractive permanent exposition, of which the *Canadian Manufacturer*, of September 6, says:

Two years ago the Permanent Exhibition of Manufactures in this city was first opened to the public. It was an entirely novel enterprise, nothing of its specific character being in existence in Canada, and nowhere else as far as our information goes. It was a success from the beginning, and the utility of it as a means of bringing special lines of manufactures to the favorable attention of the public is testified to by the large number of manufacturers who have availed themselves of its advantages. * * * An important feature of the enterprise is the numerous cozy and convenient offices in the building, which are offered to manufacturers or their agents, who may be on the spot where possible business is most likely to originate. It is open free to the public at all business hours.

In addition to the above, it may be stated, on the authority of the Secretary of the Detroit Exposition, that its financial success is already assured, and this is only the first year of its existence.

No doubt the Cleveland committee will go to the bottom of the matter, and an interesting report may confidently be expected.

SUMMING UP THE FLOOD LOSSES.

Necessarily, it has taken several months to arrive at an approximate estimate of the nature and extent of the great floods which, on May 30 and June 1, swept with such unparalleled fury over Pennsylvania, Maryland and Virginia. They embraced the entire drainage basin of the Susquehanna river, delivering its waters eastward They were but a degree less severe in the upper waters of the Potomac and James rivers, and also in the upper waters of the Genesee, in New York, these extensions both northward and southward being parts of the same flooded area, caused by a single continuous rainfall of twenty-four to thirty-six hours' duration, ending on the morning of June 1. It was not simply or primarily a local flood at Johnstown, although the Conemaugh drainage basin felt the full force of the excessive rain. But for the more striking features of the loss of life and property there, and the concentration of public attention on them, the losses elsewhere, and especially in the Juniata and West Branch valleys, would have been taken as a signal calamity by the public.

Upon this subject, Mr. Loren Blodgett, of Philadelphia, has made an interesting computation for *Bradstreet's*, as to the losses in the various sections visited, and we condense the same into the following summary:

Pennsylvania Company, damage	$ 5,000,000
" " loss in traffic receipts	1,500,000
Baltimore & Ohio Railroad	2,000,000
Reading Railroad	500,000
Chesapeake & Ohio Canal and other public and local works	4,000,000
Losses to merchants	7,000,000
Losses to farmers	5,000,000
Losses in Conemaugh Valley	5,000,000
Total	$30,000,000

Of the above loss, $25,000,000 falls to Pennsylvania, and the balance to Maryland, Virginia and West Virginia. The loss of life, of course, is the climax of horror. Mr. Blodgett puts that in the Conemaugh Valley at 8,000, and says that of a total population of 30,000 in that valley, all of them productively employed, there are but 20,000 left, and many of these have lost all incentive to work. Five hundred of the workmen in a single mill are said to have been absolutely lost. They cannot be found and do not return to work.

TWO SAULS AMONG THE PROPHETS.

Two leading iron manufacturers of the United States, returning from the Paris Exposition, have ventured predictions worthy of record at this time. Says Andrew Carnegie:

Prices are going up abroad. Steel rails there are now selling at the same rates as here, and steel plates and all forms of iron, steel, coke and all allied industries, are advancing in price rapidly. It does not appear to me that they have yet reached their limit, and, therefore, American manufacturers can expect to have the home market, which means, that we will all be fully employed at, I think, remunerative prices.

In the same prophetic strain, the Hon. A. S. Hewitt, of New York, is quoted as saying:

The reductions in prices of steel in this country have been made through the adoption of foreign processes, but steel is to be cheapened very much more. I saw steel made repeatedly from low-grade pig at a cost of $4 a ton. On account of the difference in the cost of labor we cannot do that here, but we can take the pig iron of the South, costing say $8 a ton, and convert it into steel at a cost of $7 more. This process will be introduced here at once. I look for an unprecedented extension in the consumption of steel in this country. It will be produced at a price so low that it will be used in an almost infinite number of places not now thought of. The process of producing aluminum has reached a point where the metal costs only a dollar a pound. Should it reach the cost of steel, of which there is now a possibility, it will create a revolution in the arts. The world never gave such promise of producing wealth at so low a cost as it does now.

No one, who has made an intelligent study of the recent drift of events in the iron and steel world, can doubt the substantial accuracy of the above prognostications.

Few citizens of Ohio realize the extent of the natural gas business in this State and Indiana. Colonel Calvin S. Brice told a *Saturday Globe* reporter, the other day, that there are some $85,000,000 invested in natural gas in these two States. A profit of twenty per cent. on the investment which accrues to the various companies naturally attracts Eastern capital. Mr. Brice figures that speculation in natural gas grows at the rate of $5,000,000 per annum. The extreme possibilities of natural gas are as yet unknown. When it is properly understood, and companies are organized and prepared to carry it into every household, this will be readily appreciated by many who are now reluctant to recognize its merits. To sum up superficially, these are, first, convenience and utility; second, luxury; and third, its cost, which is from 25 to 33 per cent. cheaper than coal or other fuel. Mr. Brice deems it only a question of a few years when the great iron industries, which at present centre in Western Pennsylvania about Pittsburgh and Alleghany, will remove to the natural gas region, most probably in Northern Ohio.

NEW ENGLAND is not the only section that is suffering from the shifting of iron trade centers. The New York *Commercial List* makes the somewhat startling admission that "New York no longer occupies the position as an iron market that it held a few years ago." "This," it explains, "has been due in part to the falling off in the importations and consumption of foreign material, in part to the development and establishment of an important iron and steel industry in the West and South, which finds a market for its products not in New York, but throughout the West, Northwest and South. As

a market for crude as well as finished iron and steel, and nearly all related products, New York city is likely to find her trade gradually diminishing and drifting away to the centers that are nearer the source of supply and production as well as of consumption." There is no doubt of this, and the sooner the Eastern iron manufacturers and dealers realize it and adapt themselves to the changed situation, the better for the welfare of themselves and the trade at large.

FOR the benefit of our genial but somewhat erratic contemporary, the *Age of Steel*, we will say that the danger to our tariff system would be just as great, whether the demand for "free raw materials" came from the Bethlehem Iron Company and the Pennsylvania Steel Company, or from the new English owners of American steel plants. They would be essentially in the same boat—both enemies of our present industrial system. We say this unreservedly, but we fear it will have no effect upon the reasoning faculties of a lournal which, of late, has distinguished itself by defending speculation, pure and simple, and by evincing an unmistakable leaning toward Free Trade.

THE Boston *Commercial Bulletin* makes the point that the buying of established plants by foreign capitalists will release a corresponding amount of American capital, which will be used in further developing the resources of this country. In other words, the country will be just so much the better off for the new enterprises which the investment of foreign capital directly or indirectly will bring about.

FROM UNKNOWN CAUSES.

PROF. J. F. ELSOM.

The press of the country is replete with accounts of disastrous explosions of steam boilers, both on land and sea, and thousands are made to mourn for thousands slain. The verdicts of experts are generally very vague and indefinite as to their origin, it often being "from unknown causes," that being given so often of late years, that engineers are becoming more watchful and careful. Nevertheless, boilers, with the most constant watchfulness and care, continue to explode from "unknown causes," with the resulting loss of life and property. When, however, we take into consideration the fact that, at the least, the iron out of which boilers are composed is subjected to a variety of pressures, two of which, atmospheric and steam, cause all principles of screws and hydraulics to sink into comparative insignificance when compared with them. There are also active influences, the character and nature of which are known and their homes are practically demonstrated by engineers. These are entitled to consideration before the question of steam and atmospheric pressure are calculated as a motor of demolishment. These are without doubt the cause of more boiler explosions than these pressures, singly or combined, suggested in the foregoing.

These, viewed from the standpoint of the analyst, will be catalogued in their order of importance, the first being incrustations. It is a fact, universally known and conceded by all who have taken pains to investigate this matter, that, throughout the United States where steam boilers are used, there cannot be found, in the water used for generating steam, that, subjected to a rigorous test by the chemist, will show the proportion of mineral or other elements equal by precipitation, which, of course, is the primary source and origin of incrustations. We learn also that in all processes, known to modern chemistry, that there are no better methods of extracting this heavy mineral matter than by rendering volatile the liquid portions, a process conducted in the most efficacious manner possible, the ebullition is conducted in a vacuum, as is the case in the process of generating steam in the battery of boilers.

Then, as stated in the foregoing, two samples of water containing the same elements, in like proportions, are hard to find in the United States. I may say it is rarely impossible to find such taken from different sources. No one would suppose that boiler manufacturers can take into consideration these deviations, when they select their materials for constructing the boilers fully up to the requirements of the specifications, and I believe that the time will surely come, in the history of boiler making, that the nature of the water to be used in them, perhaps a chemical analysis, will be an important covenant in all boiler contracts, and perhaps some day it will be considered practicable to construct boilers to suit the water as much as the variations of climate.

Again, with an experience of twenty years, I have often found water used in steam boilers to possess a decided corrosive influence, especially in the large manufacturing centers, such as acids, when the water is used from cisterns, which, when brought in contact with the iron or steel of the boilers, soon brighten and discolor the water; in other samples, elements which seem to have an affinity for the iron or steel, uniting with it, as in the case of calcium, while still others contain a sediment, perfectly neutral, having no chemical action whatever, merely having a mechanical action, clogging up the flues and the like, as will magnesia, the milder alkalies, etc.

Very careful observations have shown, that regardless of the nature and composition of these boiler incrustations, the precise place in the boiler where these precipitates occur, is where the two forces meet, hot and cold water making a line of demarcation of these deposits, and in nearly all building explosions, when the circumstances and debris would permit of close investigation, I have found this very line of demarcation the origin and seat of such explosion, the boilers let go here.

If necessary, one could cite hundreds upon hundreds of instances of broken boiler plate examinations to corroborate this, but this is not necessary at this time, though I will relate a little experience we had a short time ago in this direction. Subsequent to a terrific explosion of a large boiler, which demolished and destroyed a magnificent mill plant, the insurance companies refused to settle—as is often the case—claiming it was not their loss, etc., and we had the good fortune to chemically examine sections of the iron liberally coated with an incrustation, composed largely of lime. This simple element, found in nearly all American waters, had formed such a perfect union with the iron that the most delicate tests failed to define a distinct line of demarcation, showing where the line ended and the iron began, for the very outside surface of the portion of the shell furnished, the boiler being of iron, when tested, showed unmistakable evidences of traces of lime in its composition while the incrustation proper responded promptly to the test for traces of iron. In this case the iron had lost all of its native tenacity, its molecular cohesion being mechanically destroyed by the lime being insinuated between them in the processes of expansion and contraction, the nature and power of which, in this connection, I will doubtless discuss at another time.

Continuing these investigations, I found in another portion of the same boiler shell, very thin places, the iron having been gradually eaten away by some corrosive substance traceable, doubtless, to the water also, in fact, in two places this sheet was very thin indeed, but when the boiler exploded not a single fracture of these thin places could be found anywhere. It is possible there may have been such, however, though the thin portions examined had none of them lost their tenacity, the iron as fast as injured seemingly fell off and was washed away by the boiling water without injury to the rest of the iron. Here we have two causes of the many, either of which is sufficiently ample in itself to cause an explosion, the report of which would probably be "from causes to the jury unknown."

Some engineers and technical writers have held that super-heated steam in boilers is a prolific source of explosions, it being mixed, in the form of vapor, with the steam not so heated, a great increase of pressure being the result. But I had much rather recognize, as a theory, the facts, as practically demonstrated by direct tests, than this opinion, though I do not wish to advance my own by ridiculing others. More recent investigations, however, would seem to warrant the conclusion that oxygen and hydrogen, existing in a free state in the boiler, unite with sufficient violence to cause an explosion. So apparent is this that I will continue the investigations from this theory and give the results at some future time. In these, as well as other investigations, it is supposed that the boilers are well and properly constructed of the best materials, for, as a rule, boiler makers are anxious to retain their reputations, and, like all other artisans, dislike to learn of a disaster, traceable to poor material or workmanship. At another time I will take up other, but by no means minor causes of explosions. This will give all ample opportunity to ask questions, and, if need be, submit samples to investigate.

THE VALUE OF A HOME TINPLATE INDUSTRY.

On the basis of careful calculations, made in the Spring of 1888, by Mr. William Weihe, President, and Mr. Willam Martin, Secretary, of the Amalgamated Association of Iron and Steel Workers of the United States, the 283,836 gross tons of tinplates which we imported in the calendar year, 1887 represented in wages paid British workingmen over $10,000,000. If this quantity of tinplates had been made in this country the American standard of wages would have given our workingmen for this work, about $23,000,000. This vast sum of money, representing wages only, would not be retained in one industry but would be distributed among many industries. The iron-ore miners would be called upon to produce nearly another million tons of iron ore. The limestone quarry-men would be required to produce over 300,000 tones more of limestone. The coal miners and coke producers would be asked for an additional 2,000,000 tons of coal and coke. The blast-furnacemen would be required to smelt 400,000 tons more of pig iron. The lead miners and smelters would have a market for another 5,500,000 pounds of lead. The cattle raisers and meat packers would be called on to furnish a large part of the 13,000,000 pounds of the tallow and palm oil required. The chemical workers would have a market for nearly 40,000,000 pounds more of sulphuric acid; and the lumbermen would be called on for an additional 12,000,000 feet of lumber. The production of all the articles above mentioned, which are required in the tinplate manufacture, would necessarily create an active demand for many other products, such as fire-brick, clay, lubricants, hemp, etc., but the extent of which can not easily be estimated. At least 35,000 workingmen could be given employment in this country to fully supply the demand of the United States for tinplates. The farmers would be called upon to supply them with breadstuffs and provisions.

An Arctic Railway.

The Swedish *Post och Inrikes Tidningar*, for July, states that the surveying of the line of railway from Lulea to Ofoten is now complete. This will be by far the most northerly railway in the world. Lulea is a small town on the coast, near the head of the Gulf of Bothnia, in Sweden, from which the line will start almost due north, soon crossing the Arctic Circle, and will proceed through the mining district of Gellivara; it will cross the river Kaitum, at Killingi, where the railway bridge is nearly completed, and then, turning to the north-east, will cross the mountain frontier into Norway, and reach the Atlantic Ocean at Elvegaard, on the Ofoten Fjord. The line has been in rapid course of construction since last October, when 1,800 men were engaged to work on it. The extreme severity of the climate and the violent changes of temperature have been found very greatly to add to the labor of the work, and it is no longer expected that the line will be opened this year.

KRUPP uses 3,000 tons of coal and coke daily.

BASIC STEEL MAKING AT BIRMINGHAM, ALA.

BY WM. B. PHILLIPS.

The Henderson Steel Co., of this city, is now building a new 15 ton furnace for making basic steel under the patents of James Henderson. It is building, I believe, under drawings furnished by S. T. Wellman, the well-known and excellent steel maker, formerly of Cleveland, and now of Chicago. The furnace is expected to turn out from 30 to 45 tons per day, and will probably make its first melt about the middle of November. It occupies the site of the old furnace at North Birmingham, which was built about 18 months ago, really as an experiment. This first furnace was poorly constructed, and although it yielded soft steel of excellent quality, as a steel furnace its record is nothing to boast of. What it actually did, however, was to demonstrate what, perhaps, was not to be doubted, that good steel could be made of the pig of this district. The cost at which this was done is another question. From the construction of the furnace, and the way in which it was managed, the cost per ton of ingots must have been in excess of good practice.

The new furnace will be in every respect far better than the old one, and under the management of Messrs. Gogin and Robinson should prove successful. Mr. Gogin was formerly connected with the Norway Iron Co., of Boston, and Mr. Robinson is a practical steel melter of wide experience and known skill. The Henderson Steel Co. will soon have a fine opportunity of showing its faith by its works, for its works will be better than ever before. I do not propose to enter into the question of patent rights, with this the metallurgist has nothing to do. The Henderson Steel Co. claims to hold the patent rights for the manufacture of basic open-hearth steel, granted to James Henderson. They propose to make steel under these patents, and are now building a furnace especially designed for such practice. It has been shown by this company that good, soft steel can be made by this process, and they have faith enough in it to tear down the old furnace and build another in the best manner and of the best material. So far so good. The first melt of soft steel was made more than a year ago; no additional information of much value has been given since, and the works have been run in a desultory manner, not by any means calculated to inspire the inquiring public with much enthusiasm. It may of course be said that it is not the legitimate business of a steel company to inspire the public with enthusiasm, or anything else. But the company spoken of is a stock company, shares of its stock have been bought and sold at the Stock Exchange here, and it has advertised to sell the right to make Henderson steel. Further, it has stated that when pig of 3 per cent. phosphorus is used the steel is made free of expense except for the royalty of, say $1 per ton. It has invited criticism because it has invited customers. Judicious criticism never yet injured a man, a company or a process, so that when this company is asked to explain how the bye-products from 3 per cent. phosphorus pig turned into steel are to pay for the cost of making the steel, excepting the royalty, it is a fair question.

Further, it is a fair question to ask of this company if the cost of making Henderson steel decreases with the increase of the phosphorus in the pig, until with 3 per cent. phsophorus, the only item to be charged against the steel is the royalty? If this is what is meant we would have an increasing value in the bye products; in other words, the bye-products of making steel from 3 per cent. phosphorus pig would be worth more than the bye-products from 1 per cent. and 2 per cent. phosphorus pig. In some of his specifications Mr. Henderson speaks of recovering the phosphorus as such from the flue gases by passing them into water, or otherwise cooling them so that the phosphorus can be strained off through linen bags and brought into trade as phosphorus. In the present state of our information as to the chemical reactions which take place in the Henderson furnace-hearth, we are not justified in making any unqualified assertion. Henderson himself appears to lay great store by the fluorspar added from time to time for dephosphorization. But a small amount of the phosphorus originally present is found in the slag, so I am informed; the steel is comparatively free from it, and we may therefore assume that it is in great measure volatilized. But in what shape? According to Mr. Henderson, in a shape permitting of its easy recovery as metallic or metalloidal phosphorus. I say *easy* recovery, because if it were otherwise the cost of the steel would have to be charged with something else besides the per ton royalty tax, unless the value of the phosphorus recovered be the mainstay. With our present lights we may suppose that the phosphorus passes out of the hearth in combination with fluorine. This is what Mr. Henderson claims, though he does not specify the exact, or even the approximate compound. I think that the weight of scientific authority is decidedly against the possibility of forming with phosphorus and fluorine a compound, which by passing into water will yield phosphorus. The claim that phosphorus can be recovered in this way from the flue gases of a steel furnace has never been substantiated on anything like a commercial scale, and those who attempt to make the phosphorus recovered in this way bear the burden of the cost of the steel, will soon find that the linen bags provided for this purpose are "dead stock."

It may be argued that so long as the steel does not contain objectionable amounts of phosphorus it is of small consequence as to what becomes of it. From one point of view this is true enough, but until it is known what does become of it, how can it be claimed that a large amount of phosphorus in the pig diminishes the cost of the steel?

I desire distinctly to disclaim any intention of reflecting upon the advantages of the Henderson process. I know that good steel has been made by it, and I believe that it can be used in this district with Alabama pig, but I must confess to an abiding curiosity as to how the bye-products are to pay for the steel. This is the ghost that will not down, and, like the raven, perches upon the pallid bust of Pallas and stays there. Basic open-hearth steel is no brand new thing, but valuable bye-products from it are, *i. e.*, so valuable as to pay for the steel. It is more than likely, as has already been pointed out by A. E. Hunt (Trans. Amer. Inst. Min. Engrs., Vol. XVI., pp. 726 and 727), that basic steel has still to win its fight in this country. What was said by Mr. Hunt a year ago is still true: "It is not likely that the basic process can be advantageously used for making pure steel from high phosphorus stock for the best grade of open-hearth work; at least, not for the present." And he goes on to say that it is not the basic open hearth process, *per se*. that will be objected to, but the danger arising from the use of high phosphorus stock, and from the tendency to trust to the basic slag to remove the phosphorus to proper limits.

The truth is that the basic open hearth is just as dependent upon uniform purity of stock (within its own limits, of course) as is any process for making pure steel.

The Henderson Steel Co. will soon be on trial. After many and vexatious delays the new basic open hearth furnace will soon be completed. They have experienced steel melters in charge of the process, and the public is deeply interested in the results of this new departure. Now let them see to it that a uniform quality of stock suited to basic open-hearth work is provided and kept on hand. It is idle to say, as has been said, that this process is independent of the quality of the furnace stock. Such an assertion on the part of any one merely shows his misapprehension of the fundamental principles of steel making. No one can make a silk purse out of a sow's ear, and no one can make pure steel by any process from stock unsuited to that process.

I am a firm believer in the future of Alabama as a steel-making State, but we cannot dump all sorts of things into a furnace, call it Henderson or open basic hearth, and expect to get pure steel from it.—[Engineering and Mining Journal.

MAKING IRON ON THE PACIFIC COAST.

The *Pacific Coast Wood and Iron*, of recent date, contains the following article:

That we have on this coast iron ore in great abundance and of the best varieties, is generally well known. As regards California, such deposits exist in many localities widely distributed over the State. Begining on the Oregon border and extending to Mexico, in as many as eight or ten of our counties these deposits are notably large. And yet but little iron has ever been made in California, nor is it probable that any considerable quantity will be for a long timeto come.

Seeing how well our State is stocked with this ore, certain political economists are constantly insisting that our capitalists ought to engage in the manufacture of this metal, ever prodding them on to make the attempt, these economists being ignorant of the fact, apparently, that some of our most enterprising citizens have already to their great cost made such an attempt. If we could profitably produce enough of this metal for home consumption it would, of course, be very desirable that we should do so, but even this, under existing circumstances, seems impracticable.

Now nearly ten years ago Egbert Judson, actuated by a desire to promote our domestic industries, having associated himself with several other of our leading business men, organized what was known as the California Iron Co., for the purpose of manufacturing pig iron in this State. Large tracts of timber land containing immense deposits of good iron ore, situated near Hotaling, Placer County, were purchased for carrying out this design. Here a very complete iron plant was erected, the structures put up including blast furnace, houses, shops, bridges, dams, etc., a large steam engine having been procured to furnish motive power.

By the month of April, 1881, these works were finished and the business of making pig iron was begun, the furnace having turned out that year at the rate of 500 tons per month for the time it was in blast. During the first six months of the following year the production was somewhat larger; but it becoming evident that they were losing money, the company, at the end of these six months, suspended operations.

Being of the opinion that they could, by multiplying the objects of their enterprise, make it a success, the larger holders in this company, taking in some more men of large means, formed a new association, styled the California Iron & Steel Co., it being the purpose of the new organization to manufacture bar and plate iron as well as steel rails, pig metal, etc.

In pursuance of this purpose another immense establishment, the Judson Manufacturing Co., was organized, and which in turn proceeded to put up at West Oakland, rolling mills, foundry, and shops of various kinds adapted to the making of agricultural implements, hardware, etc.

Meantime, the new Iron Manufacturing Co., who had bought the entire plant and properties of their predecessor, enlarged the capacity of their smelter, increasing thereby their product of iron to the extent of one-fourth or more. Notwithstanding they turned out a good article, their iron meeting with ready sale in the San Francisco market at extreme prices, the new company found their business so unprofitable that after an experience of less than two years they were forced to give it up. That it will not be resumed may be inferred from the fact that their iron and timber-bearing lands, amounting to many thousand acres, having been sub-divided into small tracts, are now offered for sale, every acre of this land being well adapted for fruit growing. With such ending of a heavily capitalized and well managed enterprise, it may be concluded that iron making in California is ended, at least for the present.

At Port Townsend, Washington Territory, and also at the Oswego works, near Portland, Oregon, some iron is being made. Although the quantity turned out at these places is not large, it more than suffices to meet local demands, much of the product finding a market in this city. Since their erection several years ago, these works have been most of the time idle, and when they were last started up it was thought the much railroad building going on in that northern country would create such a demand for iron as would tax the productive capacity of these works to the utmost; but such, it seems, has not been the case, these railroad builders obtaining all their rails and most of their other iron from the East.

AMONG THE IRON MINES.

Lake Superior Mining Notes :—

GOGEBIC RANGE.

The find of ore at the Eclipse is showing up better every day the work progresses. Capt. Thomas Luxmore, formerly of the Auer exploration, Florence, has charge of the property.

Work is being energetically pushed at the Commercial, and the management are sanguine of showing up good ore before many weeks.

MARQUETTE RANGE.

The Iron Valley is the title under which the latest acquisition to the iron ore prospects in the corporate limits of the city of Ishpeming will probably be known. The company conducting the exploration consists of Mr. C. R. Ely, James Ames, P. E. Lundquist and M. J. Finn, and the property is a portion of that secured by the first three gentlemen named, at the time the East New York lands were leased. The lease called for four forties. The East New York has taken up the two on the West, lying on both sides of the Chicago & Northwestern railroad track and immediately adjoining the old New York mine on the east, and it is the remainder of the property that will be known under the name of the Iron Valley.—[Iron Ore.

MENOMINEE RANGE.

The prospects at the Ludington mine are brightening daily under the developments now being made. It is almost an assured fact that a large deposit of ore will be found in the 11th level, about 50 feet from A shaft, which is undoubtedly a continuation of the body found in the 9th level about 175 feet from the shaft. The 10th level will also be driven to the ore deposit, and the vein will be opened up as rapidly as possible.—[Range.

The Armenia is one of the luckiest mines in this district. Work has been carried on there upwards of two years and no accident to the miners has yet occurred. This may be regarded as pure luck, attended, of course, by good management. There are many mines, that no matter how good the management may be and what care is taken, accidents of the most terrible character will now and then occur.—[Drill.

At the "James option," section twenty-three, 43-32, a new shaft has been commenced two hundred feet north of the working shaft put down about three months ago, and has a depth, at this writing, of thirty feet. An additional fifteen feet will be added to its depth and then a cross-cut carried to the north. The new shaft is in a mixture of ore, lime and quartz, and from indications presented it seems that the shaft rests on the south edge of the ore body. Splendid-looking ore was taken from the old shaft, but an analysis shows it to contain more silica than is desirable, still it could be mined to a profit.—[Drill.

An area of ground 20 x 70 feet has been stripped at the Alpha which shows a vein of ore thirteen feet wide, and later developments show that the ore vein widens out as it goes down. The old workings, carried on under W. H. Mack, about seven years ago, consist of a shaft located twenty-seven feet north of the vein on top, from the bottom of which a cross-cut was carried into the ore about fifteen feet. The ore is of a good quality and there seems to be no doubt in the mind of Supt. F. H. Brotherton, in charge, but that the vein widens as it goes down and that a valuable iron property will be developed.—[Diamond Drill.

The south-west quarter of the south-west quarter of section twenty-five, 43-35, lying just east of Iron River, has become an object of considerable interest. It is a portion of what is known as the "Fred Miller homestead," and lies on the north and adjoining the Stambaugh mine property, and it is confidently expected that a large body of iron ore will be found there. After considerable negotiation, Mr. Louis Stegmiller secured an option from the parties in interest and now has a force of men at work thereon under the supervision of John J. Sipchen. Two or three pits have already been bottomed in ore of a good quality, and more is being sunk.—[Diamond Drill.

Iron Ore in British Columbia :—

From a report on the mineral wealth of British Columbia made by Mr. George M. Dawson to Dr. Alfred R. C. Selwyn, director of the Geological and Natural History Survey of Canada, we take the following references to iron ore:

Comparatively little attention has yet been given to iron ores in British Columbia, in consequence of the impression that under the present conditions they possess little or no value. Most of the ores of iron so far found in quantity are magnetites, which occur in association with the older metamorphic rocks of the province. Clay ironstones are, however, of frequent occurrence in the coal series of Vancouver and Queen Charlotte Islands, as well as in the tertiary rocks of the interior.

The only iron ore deposits which have yet been worked are those of the southwest side of Texada Island, the largest exposures of ore occurring about three miles north-west of Gillies Bay. Here the ore mass is seen to be from twenty to twenty-five feet thick, and constitutes a somewhat irregular contact deposit between limestone or marble and granite, thin veins of the ores being occasionally found reticulating the limestone. From this point to the northward, for nearly a mile, the ore is occasionally seen, and at one place there is a continuous exposure about 250 ft. long and from 1 ft. to 10 ft. thick. As regards mining and shipping, the ore is most favorably situated.

The ore is a magnetic of excellent quality. A partial analysis by Dr. B. J. Harrington, in the laboratory of the survey, shows 68.40 per cent. of pig iron, with only 00.003 per cent. of phosphorus. A partial analysis by Whitfield, representing a lot of 600 tons, shows iron, 65.71; phosphorus, 0.013.

At the principal deposits of ore, situated as above described, a wharf has been built, and excellent arrangements made for mining and shipping. The ore is brought to the wharf by an incline nearly a quarter of a mile in length from the point at which it is quarried out, about 250 ft. above the sea-level. Considerable quantities of ore have been shipped from time to time to the works of the Puget Sound Iron Co., situated at Irondale, Wash. Ter. The Texada ore is there mixed with from one-ninth to three-tenths bog-ore, found near Irondale, and produces thus, or when smelted alone, an excellent quality of foundry pig. The shipments in 1885 amounted to 190 gross tons; in 1886, 3,941 tons; in 1887, 1,410 tons, and in 1888 to 7,300 tons, valued at $18,400.

Iron ore deposits of the same character and in considerable mass are again found on the opposite or northeast shore of Texada Island, and very probably are more or less continuously developed along the contact of the granites and limestones elsewhere in the island. Magnetic iron ores of somewhat similar character occur in the hills to the east of Scoke Harbor, Vancouver Island, also in the Queen Charlotte Islands, on the east side of the entrance to Harriet Harbor, Skinkuttle Inlet.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior, for the season of 1889, up to Wednesday, September 4th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	11,007	Hartford	524	Queen	37,323
Barnum	3,711	Humboldt	9,907	Republic	217,973
Braastad	71,816	Jackson	43,250	Republic Reduction Co.	16,261
Buffalo	24,750	Jackson, pit 7	8,528	Riverside	2,001
Buffalo, South	2,774	Jackson, pit 8	18,211	Salisbury	15,472
Cambria	29 459	Jackson, South	12,004	Salisbury Bessemer	18,561
Champion	131,663	Lake Superior	40,668	Samson	449
Cleveland	155 288	Lillie	24,029	South Buffalo	40,561
Cleveland, Hematite	32,335	Lucy	11,714	Superior	91,021
Cliffs shaft	89,613	Marquette	48,031	Superior, Hematite	60,224
Curry	12 c99	Marquette Ore Co.	2,721	Volunteer	27,382
Detroit	4,995	Michigamme	19,932	Webster	117
Dexter	3,895	Milwaukee	39,886	West Republic	1,062
East Champion	2,438	Negaunee	57,324	Wetmore	8,792
East New York	12,941	North Champion	7,109	Winthrop	15,623
Edison	893	Pitts. & L. Angeline	155.487	York	11,360
Grand Rapids	5,007	Prout	3 820		
Total, Marquette Range					1,672,709

MENOMINEE RANGE.

Armania	32,269	Hamilton	6,570	Paint River	16,005
Chapin	337,247	Iron River	109,100	Perkins	7,240
Commonwealth	63,061	Ludington	60,368	Shafer	2,717
Cyclops	25,339	Mastodon	39,801	Sheridan	504
Dunn	87,264	Mastodon, South	1,380	Sturgeon River	4,754
Florence	107,707	Millie	8,326	Vulcan	104,445
Great Western	26,321	Monitor	6,930	Walpole	8,573
Half & Half	4,059	Norway	53,792		
Total, Menominee Range					1,127,385

GOGEBIC RANGE.

Anvil	26,588	Iron King	28,605	Pence	54,085
Ashland	153,607	Ironton	3,584	Ruby	5,793
Aurora	126,884	Montreal	4,190	Section 33 south	26,481
Brotherton	46,490	Norrie	396,219	Sellwood Colby	18,159
Cary	27,633	North Montreal	23,184	South Colby	34,989
Colby, Beaver	22,558	North Section 33	9,577	South 15 Colby	10,221
Germania	62,397	Odanah	2,844	Windsor	12,272
Globe	7,275	Pabst	61,596		
Iron Belt	35,226	Palms	11,920		
Total, Gogebic Range					1,222,000

VERMILION RANGE.

Chandler Mine	225,723	Minnesota Iron Co.	383,316	Pioneer	2,168
Total, Vermilion Range					611,207
Grand Total					4,633,775
To corresponding date of 1888					2,612,968

The shipments of ore from the Lake Superior mines for the first week in September foot up 227,778 tons, this being fully up to the average for the season. During the same month, last year, the output of our mines by water aggregated a total of 181,638 tons. The shipments now being made are almost wholly direct from the shafts, the stock-piles accumulated during the preceding Winter having been wiped out by the unusually heavy shipments of the early part of the season. The quantity now being forwarded represents the productive capacity of the mines, therefore, as they are being wrought with the forces employed, and the present rate of output can consequently be maintained for the balance of the season provided the mine owners deem it best to continue sending to market such a quantity of ore until navigation closes down, and tonnage to handle it is furnished.

Two Ways of Annealing Steel.

It can be heated to a dull red heat, covered with dry, warm sand and left to cool slowly, or heat and cover up in the forge fire and leave it there until the fire is out and all is cold. The other method is to heat the steel red hot; heat gradually, let it "soak," as the smiths say, until it is evenly heated, then remove from the fire and go to some dark corner. Let the steel cool until you lose sight of the dull red in the dark, then cool off in cold water. A good "dark place" may be made by throwing your coat over a barrel, leaving just room enough to look in at the iron. This method is called the "water anneal," and is based upon the theory that steel softens when cooled at a certain temperature.—[National Car and Locomotive Builder.

I. O. O. F. at Columbus, O.—Excursions via the Pennsylvania Lines.

For the meeting of the Sovereign Grand Lodge, I. O. O. F., and the Patriarchs Militant, excursion tickets will be sold to Columbus, O., via the Pennsylvania Lines west of Pittsburgh, at exceptionally low rates on September 15th, 16th and 17th, good returning until September 25th, inclusive. For further information apply to the nearest passenger or ticket agent.

DURING the coming volume *The Century* is to have an illustrated series of articles on the French Salons of the Seventeenth and Eighteenth centuries, including pen portraits of many of the leaders, and a detailed account of the organization and composition of several historical salons. A great number of interesting portraits will be given with the series.

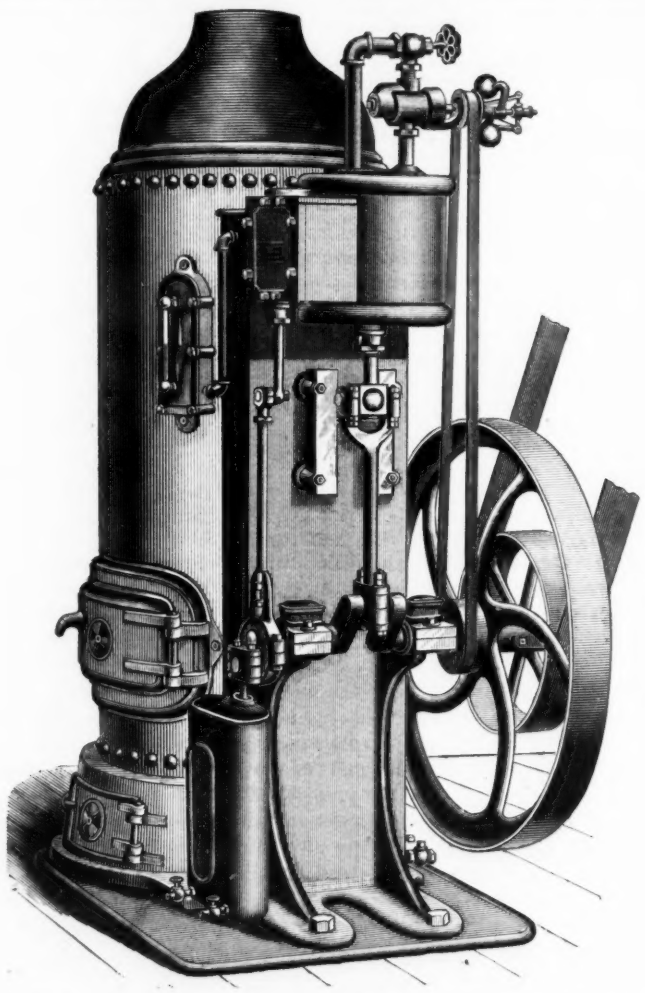
HALL BROS. & CO., of Louisville, Ky., have been appointed sole agents, in all markets, for the sale of both the charcoal and coke pig iron product of the West Nashville, Tenn., furnaces. The coke furnace is now in operation, and the charcoal furnace will blow in about October 1st.

THE WILLARD CONDENSING ENGINE.

The engine herewith shown possesses some features which will commend it strongly to all branches of industry where a small, cheap and positively safe power is required. The Willard condensing engine differs from an ordinary steam engine in the fact that while a small quantity of steam is made in the generator, which is a part of the machine, steam is not the motive power employed to do the work, the only function of the steam being to create, by condensation, a vacuum, which is the motive power. The engine is double-acting, a vacuum being created alternately at each end of the cylinder. There is absolutely no pressure in the generator, and consequently can be no danger of explosion, under any circumstances whatever.

The condensation of the low pressure steam, by which a vacuum is created, is effected by means of a surface condenser, which is kept cool by water. Where the engine is to be used in a city or town having public water service, the condenser is placed in the upright iron pocket shown at the back of the engine, and a small stream of water, for the two horse-power, one-half inch; for the four horse-power, three-quarter inch pipe, furnishes an abundant water supply to keep the condenser cool. The water is admitted at the bottom, and rises to the top, and passes off through an overflow pipe. Where there is no public water service, the engine itself operates a small pump which causes a circulation of water.

The cylinder, unlike that of an ordinary engine, does not require oiling or lubrication; the low steam used, being very moist, is a sufficient lubricant. The quantity of fuel needed is claimed to be much less than would be used in the ordinary engine, as the amount of water to be evaporated is less than half that consumed by the ordinary slide valve engine of same power, and the



water is raised to only 212 degrees, instead of 300 to 340, as in an ordinary boiler. The small amount of water necessary to be evaporated, and the low degree of temperature to which it is necessary to raise it, accounts for the economy of fuel in these engines.

Unlike an ordinary boiler and engine, in which the water level in the boiler is a matter of vital importance, and any failure of the water supply fraught with more or less danger, the water level of the condensing engine is constant and unvarying, the feeding arrangement being automatic, and the quantity of water actually consumed so small as to remove all difficulty of keeping up a supply.

Aside from the question of danger attending the use of the ordinary steam boiler under careless management, there is probably no one thing which will commend this engine more strongly to the public than the fact that it requires no attention beyond simply keeping up the fire, and giving the wheel two or three turns when ready to begin operations. There is no exhaust, no steam gauge, no gauge cocks, no boiler-feed pump or injector, or any of these adjuncts of an ordinary steam boiler.

Anything may be used for fuel that will go into the fire-box; either hard or soft coal, or wood, although the manufacturers recommend hard coal or coke as maintaining the steadiest fire. The quantity of fuel needed is small, as the amount of water to be evaporated is quite limited, and if hard or soft coal or coke is used, the cost will not, it is claimed, exceed one cent per horse-power, per hour. The manufacturers claim that it requires no watching, does not increase the rate of insurance, as the risk is no greater than from an ordinary house stove, and can be managed by a person having no knowledge of engines, a servant girl or a janitor. For further particulars, address Chas. P. Willard & Co., 236 Randolph street, Chicago, Ill.

THE EUREKA POST-HOLE DIGGER.

This tool has been thoroughly tested during the past eight years, in all parts of the country, and no place has yet been found where it has failed to give perfect satisfaction. The principle on which it works, and its construction, make it the simplest and most durable digger made. The blades are made of the best cast-steel, the head pieces of the best malleable iron, and the handles of good white ash. The blades are nine inches long, and the length of the digger when complete is five feet, weight about nine pounds. The Eureka digger was givenan extra award for distinguished merit and great excellence at the Centennial Exhibition, 1876, and samples purchased by the judges and taken to each of their respective countries for the purpose of introduction. Manufactured by Eureka Digger Co., 45 North Market street, Chicago, Ill.

A Boom in the Schuylkill Valley.

A dispatch from Reading, Pa., September 12, says: This section of the Schuylkill Valley experieuced a big industrial boom to-day. The rolling mill, pipe and tube mills and foundry of the Reading Iron Co., after an idleness of six months, resumed partial operations this morning, and within a week are expected to run full handed, when 2,000 men will be steadily employed. The company's sheet mill is already running, with 300 men. McIlvaine's rolling mill, after slight trouble with its employes, resumed work to-day, the puddler's wages being increased from $3.25 to $3.70 per ton. This mill employs 200 men. Beginning to-day S. R. Seyfurt's puddlers, as Seyfert's station, this county, will receive $4 per ton, the highest rate paid in the Schuylkill valley. At Pottstown the puddlers of the Potts Co. to-day began working at an increase from $3.35 to $3.50 per ton. The Glasgow Iron Co.'s puddlers are now working at the same increase.

Iron Making North and South.

Messrs. George O. Vanderbilt, Johnathan H. Blackwell, John H. Scudder, Ferdinand Roebling, Chas. Roebling, P. M. Terhune, Chas. B. Moore, W. D. Aiken, G. W. Devoe, H. Niemeyer and others have been investigating a proposition to build a furnace at East Birmingham, Ala. A report has been made by C. A. Meissner, formerly of Joliet, Briar Hill and Sterlington, in which that gentleman makes the following estimate of cost, assuming the furnace to be 65x14 feet:

COMPARATIVE COST NORTH AND SOUTH.

Cost of Pig Iron per ton in Alabama.	
2 tons of ore at $1.25	$2.50
1½ tons of coke at $2.25	3.40
1 ton lime at 65 cents	.65
Labor	1.60
Incidentals	.25
Interest, 4 per cent. on total capital	.20
Repairs	.50
Total	$9.10
Freight to New York	3.90
Total	$13.00
Selling price at New York	16.00
Profit per ton	3.00

80 tons per day, for 300 days, 24,000 tons per annum, or $72,000 profits at $3 per ton.

Average cost of Pig Iron per ton in Ohio and New York.	
Ore	$5.50
Fuel	5.00
Lime	.80
Labor	1.75
Incidentals	.25
Interest	.20
Repairs	50
Total	$14.00
Average freight to New York	1.00
Total	$15.00
Selling price at New York	16.00
Profit per ton	1.00

This is an average cost, taken from direct personal experience.

Mr. Meissner estimates that the furnace can be built at $100,000 to $125,000, so that a company having a capital of $150,000 would have sufficient working capital.

Shrinkage of Castings.

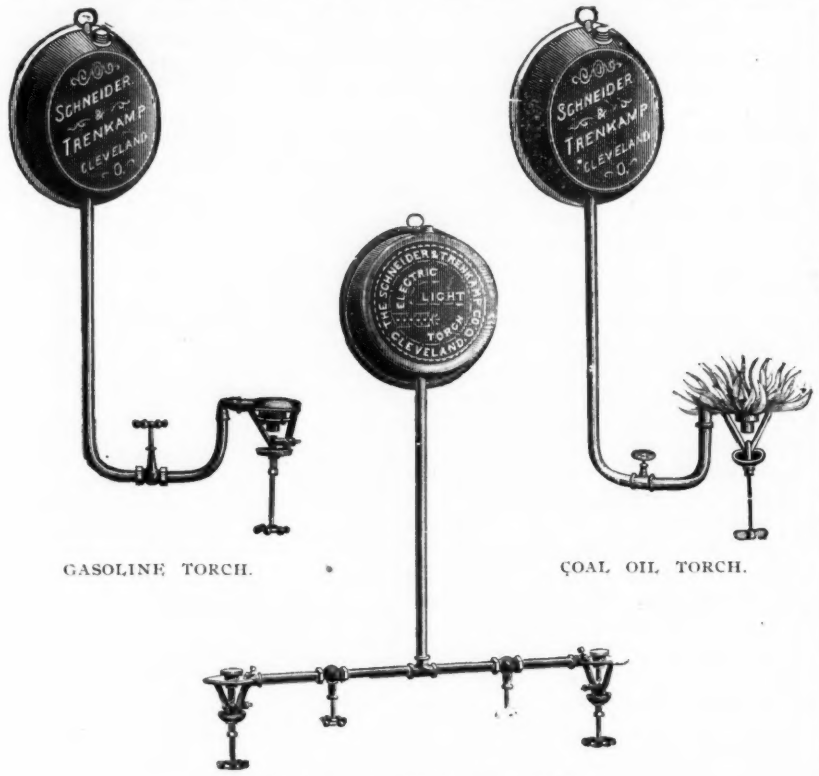
In locomotive cylinders—1-16 inch in a foot.
Pipes—1-8 inch in a foot.
Girders, beams, etc.—1-8 inch in 15 inches.
Engine-beams, connecting-rods, etc.—1-8 inch in 16 inches.
Large cylinders, say 70 inch diameter, 10-feet stroke, the contraction of diameter—3-8 inch at top.
Ditto—1-2 inch at bottom.
Ditto in length—1-8 inch in 16 inches.
Thin brass—1-8 inch in 9 inches.
Thick brass—1-8 inch in 10 inches.
Zinc—5-16 inch in a foot.
Lead—5-16 inch in a foot.
Copper—3-16 inch in a foot.
Bismuth—5-32 inch in a foot.
Tin—1-4 inch in a foot.

Perforated Saw Blades.

Perforated blades for band and circular saws are just now attracting attention in Germany, and are apparently giving general satisfaction. Blades of this character are not entire novelties, but have been known in modified forms for some years. As a general thing, however, their use has been much decried. Still they appear to have some advantages worth considering, and many claims for superiority are made for them. Among them is that of reduced blade friction, due to reduced area of rubbing surface; less tendency to heat, because of the circulation of air through the holes, and economy in power. The holes further prevent the dangerous extension of cracks in the saw blades, and, in general, make it a comparatively easy matter to keep the saws in good running order.—[American Machinist.

CONVENIENT TORCHES FOR IRON WORKS.

Illustration is herewith given to a very convenient form of torches, known as the "Electric Gasoline and Oil Torches." They are especially adapted for lighting factories, foundries, machine shops, blacksmith shops, rolling mills warehouses, docks, markets, camps, fishing grounds, bath houses, etc. For outdoor lighting they are particularly desirable, as they are not affected by wind, rain, cold or heat. They produce a large, brilliant white flame, equal in



GASOLINE TORCH. COAL OIL TORCH.

GASOLINE OR COAL OIL TORCH.

volume to 10 gas-jet flames. They are light to handle, can be hung anywhere and are extinguishable instantly when done with. The reservoirs hold nearly six quarts. The gasoline torch will burn full flame nine hours, and the oil torch fifteen hours and a half. The cost of lighting will be in the proximity of one cent per hour. Manufactured by the Schneider & Trenkamp Co., Cleveland, O.

BAND SAWS FOR METAL.

BY LEWIS F. LYNE.

Several months ago I recommended a band sawing machine to a friend of mine for cutting the gates off brass and bronze castings, in a foundry. This machine, made by the Pratt & Whitney Co., is in principle an ordinary band-sawing machine, consisting of a G shaped *frame*, with table, 27 inches square. This table stands 39 inches from the floor, and has a gauge which may be set at all angles, and is moved 8 inches by means of a screw and hand-wheel. The screw, with wheel, may be readily detached so that the slide can be moved by hand in cutting light sheet metal. In cutting gates, this gauge is removed, and the slide is not used at all. The wheels that carry the band saw are 28 inches in diameter, with straight, smooth faces, upon which the saw lies without injury to the teeth, therefore, the rubber covering which is always put upon the wheels of machines used for wood saws is not needed in this case. The lower or driving wheel is connected by means of a gear wheel having 50 teeth upon the end of its shaft, meshing into a pinion having 20 teeth. A cone having four steps is attached to the pinion shaft, so the revolutions of the cone are two and one-half to one of the 28-inch wheel, which gives the requisite power to drive the saw.

I run the countershaft 195 revolutions per minute, with the belt on the 11-inch step, next to the slowest speed for cutting bronze, the steps being 7-inch, 9-inch, 11-inch and 13 inch in diameter, respectively. This gives about 463 feet travel of the saw per minute. The upper or driven wheel is adjusted by means of a pin wrench inserted in holes drilled in the nut for raising and lowering the bearing as shown. The tension of the saws, which are each 16 feet long, should be only sufficient to keep the saw straight, as it will not then be as likely to break as when it is drawn up like a fiddle string. A little common sense is all that is necessary for the successful operation of this machine. The guides above and below the table are provided with hardened steel wheels to relieve the friction of the saw. The upper guide may be adjusted to all kinds of work up to 8 inches thick, while the distance from the saw (which passes through the centre of the table) to the arched frame is 27 inches, therefore it will cut pieces of metal that length. The bearing of the upper shaft is pivoted so that it can be adjusted by a set screw. Thus, by tipping the wheel either way, the saw may be made to run so that it will just touch the steel wheels in the guides. The weight of this machine complete is 925 lbs. The first saws that I tried for cutting the gates off brass and bronze castings were hardened all the way through. They had 14 teeth to the inch, and were three-eighths and half-inch wide, respectively. The steel was No. 23, Brown & Sharpe gauge, in thickness. These saws would cut very well for, perhaps, ten minutes, when one tooth would break out by being jammed endwise into the tough bronze, where it would stick fast and strip out all or most of the other teeth that were left in the saw. The saw would then be removed and another one substituted, when it was again found that a single tooth breaking would jam in the slit, and strip the entire saw. Both widths of saw used behaved precisely alike, so I then had two band saws made a little harder than those used for cutting wood, with eleven teeth to the inch. While these saws stood very well for, perhaps a half-hour steady cutting, and without breaking the teeth, I found that it would not pay to entertain the idea of filing the teeth. It would take too much time, and these saws would not cut phosphor-bronze gates at all, for the sand seemed to be burnt into the surface of the metal, making a skin very hard to cut. I then had two saws made of clock spring steel, with ten teeth to the inch, but with no better results.

From these experiments I concluded that the saw that I was in search of must have about fourteen teeth to the inch, with a considerable set, and about No 23 B. & S. gauge in thickness. My opinion was that this saw ought not to be more than ⅜ inch wide, because it could be guided much more easily than the half-inch, especially after the set had been worn off one side by cutting through the sand. The points of the teeth should be so hard that they could not be touched with a file, but the rest of the saw must be soft. In other words, the ideal saw for bronze castings must be hardened only on the teeth. Accordingly, I went to the factory of Henry G. Thompson & Sons, New Haven, Conn., where, after explaining, I procured just what was wanted. With the first saw I cut off 156 gates, equal to about 72 square inches of metal same thickness as the saw. The next saw cut 247 gates, equal to 79 square inches of metal, while the next saw cut 150 gates, equal to 69 square inches of metal, and the next cut 126 gates, equal to 90 square inches of metal. Some of the gates were 3 inches in diameter, and were of hard bronze, being cut off in five minutes' time each. Many of these gates were 2¼-inch in diameter, some 1¾-inch and 1½-inch of phosphor-bronze. We were not particular in cleaning off the sand, either. The castings were laid upon the table, and a bit of wood placed under the gate so that as the saw cut through it could not jam. A stick was used to press the gates against the saw, and not much pressure is required. For cutting iron or steel the hard saws might answer, but they will not do for bronze. Every machinist (almost) knows that brass tubing is the worst material to cut with a hack saw, because if the saw is the least bit hard as it comes through the side of the tube the teeth will catch and tear them out. Such persons will be surprised when I say that 6,000 cuts have been made with one saw on brass tubing for gas fixtures with one of these saws before it was dulled enough to lay aside. These saws can be and are used for cutting up all kinds of metal, such as iron, steel, and the alloys, for the reasons that in no other way can such material be put into practical shape so cheaply. I feel so much pleased with the success of my experiments that I have been induced to publish these results to aid and encourage my fellow-workmen who might become discouraged and condemn the whole process before they obtain satisfactory results. When these flexible-back saws are dulled they are laid aside, being replaced by new ones, as the cost of each new saw, ⅜-inch wide, is but 85 cents by the roll. In cutting off gates with a hammer and chisel, the gates often break into and spoil the casting, besides it is a slow process, whereas with a band saw the gates can be cut close, quick, and require no filling.—[Railroad Gazette.

CONVEX COAL SIEVE.

The accompanying cut represents the convex coal sifter, made of sheet metal, now being introduced to the trade. The first and most important point is the convex bottom which admits of no ashes accumulating in the centre while sifting, but produces a motion by which the ashes gyrate around or over the convex bottom, sifting perfectly clean and overcoming the most grievous fault of the flat bottom sifter. Next it is made of the best No. 26

sheet metal and is double seamed at the sides, making it the strongest where all other sifters are the weakest.

It is being put on the market by the Lock Haven Sifter Co., 120 East Main street, Lock Haven, Pa. This company is just starting in business and is receiving large orders for its goods. It can turn out 15 gross per day. J. H. Fredericks is general manager, with 15 years' experience at sheet-metal work, and the inventor of the Crown saucepan that will not burn, now being introduced by Hall & Carpenter, Philadelphia, Pa.

American Mining Engineers.

The fifty-fifth meeting of the American Institute of Mining Engineers will be held in her majesty's dominion at Ottawa, Ont., October 1, 1889. Every arrangement has been made for the comfortable accommodation of the visitors, and special rates agreed on with the railway companies. Excursions will be made by rail and river to neighboring phosphate mines, and places of interest in the vicinity, and two special trips have been arranged. The first a journey to the Sudbury copper mines, the Port Arthur silver region, and the north shore of Lake Superior; and the second a tour of the asbestos mines at Webford and Colerain, the Oxford copper mines, the Rockland slate quarries, and the Capelton chemical works, with a run to Montreal and Quebec. The indefatigable secretary, Mr. R. W. Raymond, desires those who intend to be present to take tickets on the "certificate" plan, which will entitle them to a reduction in rates.

THE shipping trade between New Orleans and Central America employs 1,000 seamen, mostly Norwegians, Swedes and Danes. They get $25 per voyage

FOREIGN COMMENT.

German Ship-building in 1888.

In looking over the results attained by the large German ship-builders in 1888, in comparison with its unfavorable predecessors last year, may on the whole be considered as very satisfactory. As likewise in the improvement which took place in German shipping in 1888, the expansion in trade was reflected not only in the trade of the Hansa towns, but in that of the whole world, and naturally the reflex action on the German ship-building trade was very great. The returns of ship-owners, which had again become renumerative, as might be expected, was of advantage to the German ship-building industry, which, although relatively young, has developed greatly in the last few years, and by the good and solid character of the work, a considerable reputation has been acquired. In 1888, and especially in the second half, a visible expansion took place in the German ship-building trade, owing to the increased demand for shipping and the better freights paid.

Profit-Sharing in Germany.

A very remarkable arrangement is said to have been made in the engineering works of Mr. G. A. Schutz, here. This gentleman, it appears, has placed 5 per cent. on the amount of their annual wages in the local savings bank to the credit of all those who have worked in his establishment uninterruptedly during a space of five years, ending the 1st July last, and for all others he has paid 3 per cent. into the savings bank. These payments will be continued each year, and at the end of five years, thus in 1894, each person will have the right to withdraw the sum standing in his name together with the interest. Sickness and military service will not be regarded as interruptions in the employment. In case of death the relatives of the deceased will receive the amount paid in. Mr. Schutz evidently desires by these means to retain in his establishment a body of trustworthy workmen. This is commendable. Further, as Mr. Schutz's name is a guarantee that this advantage will not be rendered illusory by screwing down the wages, he certainly deserves the widest recognition for this step.—[German Trade Review, Berlin.

Mechanical Stoking vs. Hand-firing.

Messrs. W. Armstrong and W. J. Bird, of Wingate, Durham, have been making a number of experiments upon boilers, in order to test the advantages of mechanical stoking as compared with hand-firing. Their object was to make themselves thoroughly acquainted with the facts, before fitting up a series of Henderson's mechanical stokers, on a range of Lancashire boilers at Wingate Grange Colliery. The coal used and the ashes resulting therefrom were accurately weighed, and the quantity of water evaporated was ascertained by a Siemens meter, specially adapted for hot water, inserted in the feed pipe. The meter was frequently tested by comparison with a tank of known capacity. Three tests, lasting forty-eight hours each, were made to compare the evaporation by rough-small and by duff coal, fed, in both cases, by hand. The boiler, which was of the Lancashire type, 28ft. long by 7ft. 6in. diameter, was then fitted with a mechanical stoker and self-cleaning bars, and the experiments were repeated. With rough, small coal, the duty was found to be increased 33.3 per cent., and with duff 35.9 per cent. by the mechanical stoker. The general result of the application of the latter may therefore be deemed highly satisfactory.—[Glasgow Engineer.

The Iron Age in Norway.

A very interesting discovery, referring to the iron age, has been made at Gloppen, on the coast of Norway. A burial chamber 12 feet in length, and formed of stone slabs, has been uncovered, containing the remains of a man. The find in the chamber also includes a bucket, ornamented with bronze, made of lime wood (*Taxus pacata*,) two lanceheads of iron, 12 inches long, a doubled-edged sword in scabbard, with ferrule of bronze, an iron shield, a bronze buckle, some Roman gold coins, perforated and worn as ornaments, a glass beaker, green and blue color, and ornamented with etched tracings, a pair of bronze scales, some iron arrow heads, and a pair of shears in a wooden case. On the body lay two large red stones and some bronze ornaments, having, no doubt, formed part of a belt, while some bear's hair and claws seem to indicate that the body rested upon a bear skin. The most remarkable part of the find is, however, that the lining of the coat around the neck was in a perfect state of preservation, and revealed rich embroidery of images of animals and objects of unique value, and that in the hands had been placed three interlaced wooden rings, resembling the well-known puzzle rings, an object never before discovered in ancient graves, and which has given Norwegian archæologists much food for speculation.

An Engineering Triumph.

An engineering work that has taken over a century to construct is one of the most notable landmarks in history, if, indeed, it be not without precedent. An instance of this kind is to be found in a tunnel not long since completed, but which was commenced more than one hundred years ago. The tunnel, or adit, is at Schemnitz, in Hungary, its construction being agreed upon in 1782, with the object of carrying off the waters from the Schemnitz mines to the lower part of the Gran valley. The work, which is now complete, forms the longest tunnel in the world, being some 10¼ miles long, or about one mile longer than the St. Gothard tunnel, and 2½ miles longer than that of Mount Cenis; the height is 9 feet 3 inches, and the breadth 5 feet 3 inches. This tunnel, which has taken so long a period to bring to a completion, has involved an expenditure of about £1,000,000, but the saving to those interested, in being able to dispense with water-raising appliances, amounts to a large sum annually. A fact of no little interest in carrying out this project, is that, though the latter generation had greatly the advantage in the matter of machinery for accomplishing such a work, the cost of labor was greatly in the former's favor. The original contract was for the completion of the tunnel in thirty years, at a cost of £7 per yard run, and for eleven years the construction was carried on at that price. Public events, however, interfered with the progress of the work, as well as enhanced the cost of labor and materials, the cost per yard eventually exceeding £20.—[Glasgow Engineer.

Iron Industry in New South Wales.

The proposal to establish iron and steel works in New South Wales is attracting considerable attention in the press of that colony. It is said that definite arrangements have been made to organize such works on a large scale, and, wonderful to relate, the promoters do not ask the imposition of an import duty, feeling satisfied that the venture can be made to pay, founding their calculations on the actual condition of the labor market. The execution of the project, however, is conditional. It is proposed that the Government should offer some encouragement by guaranteeing, within limits, purchases of the local product in preference to the imported, the quality to be equal, and the prices not in excess of the total cost of the latter by the time it is delivered to the Government. No attempt is to be made to place any statutory restriction upon the general trade of the country, every purchaser of iron and steel being free to purchase articles imported from Great Britain or Belgium, as before. The matter is said to be engaging the consideration of the Government. Its importance will be understood when it is stated that the imports from the United Kingdom into Australia for the year 1888 of pig iron, steel and iron in other forms represented alone a value of £3,500,000. The proposal is strongly supported by the Free Trade journals, and the Sydney *Morning Herald* says: "If iron and steel can be made here equal in quality to that imported from the United Kingdom, and can be sold at prices which do not exceed the cost of the imported article when freight, insurance, difference of exchange, and all other charges are included, it is certainly desirable that the local demand should be met by the local supply, and the employment of colonial labor."—[London Ironmonger.

BRITISH INVESTMENTS IN AMERICAN INDUSTRIES.

Discussing this important subject, the *Iron and Coal Trades Review* (London) of August 30, says (the italics are ours):

From New York comes the rumor of still further investments in American industries by British capitalists. The latest purchase, we are imformed, is one of the prominent iron works in the country, which has always paid its owners a good dividend. This extreme eagerness on the part of British capitalists to secure possession of industries, which we are constantly told would come to grief immediately if they were not bolstered up by a high protective tariff, is a curious sign of the times, and affords much food for reflection. The inferences to be drawn from the peculiar development of British enterprise are two-fold: *in the first place, these protected industries must be very good for the Americans themselves, or the British investor would hardly care to pay a very big price for them; or, on the other hand, it would seem to show that on this side of the water the shrewdest people have given up all hope of such a change in the American tariff as would largely benefit British steel and iron manufacturers. Failing in their assaults on the tariff, the British speculators now boldly enter the citadel and simply purchase what they cannot capture.* There is reason to believe that within the past six months over twenty millions sterling have been expended by British capitalists in the purchase of well-established American business, including iron and steel works, breweries, distilleries, cotton mills, etc. We agree with a New York contemporary, who seems to be greatly mystified by this movement, that "a well-matured scheme exists to secure control of the most profitable American iron and steel enterprises." No other hypothesis can account for this new-born preference for successful American metallurgical enterprises. We may be sure, however, that the motive is this, as in so many other cases where British investment is concerned, is simply a desire to hold property which will yield a good dividend, and has had nothing sinister in it, as a few of the newspapers are good enough to insinuate. At the same time, it does seem curious that our colonies, which certainly offer magnificent fields for the investor, should be completely ignored by the enterprising capitalists who are now so anxious to buy up profitable American industrial concerns. Canada will readily give all the "protection" that these investors may think necessary, but the Dominion seems to have been overlooked by these grand operators, and at present it would appear as if that country were destined to be developed by American instead of British capital. Whether under all the circumstances it is wise to sink so much British money in American industries may well be doubted. But it is remarkable that such industries as iron and steel works, whose very existence, we are assured, depends upon a tariff that is at best precarious in its nature, should prove so very fascinating to that pronounced Free Trader the British Capitalist.

English Capital in Another Big Iron Concern.

A dispatch from Hokendaqua, Pa., September 11, says: The annual meeting of the Thomas Iron Co. stockholders was held here yesterday, and owing to the important questions at issue, the attendance was unusually large. The old board of directors was re-elected, and then the proposition to sell the company's plant, real estate, cars, locomotives, furnaces, railroads, mines and leases was laid before the meeting. The statement was made that there had been an offer made to the directors to sell the works to an English syndicate for $3,500,000. The syndicate fixed the figure, and, if acceptable to the stockholders, they would close at once. Some of the stockholders thought the syndicate would give more and advocated an amendment that the company sell at $4,000,000. This amendment was voted down by a considerable majority, and the offer of the syndicate for $3,500,000 was accepted unanimously.

THE vessels that cross the ocean in six days burn 400 tons of coal daily.

INDUSTRIAL SUMMARY.

New Enterprises :—

Devore & Henney Co., Freeport, Ill., has been formed to manufacture foot-power hammers, capital $15,000; incorporators, L. M. Devore, J. W. Henderson, M. H. Wilcox.

The Oil, Gas & Fuel Co., Litchfield, Ill., has contracted for a $20,000 plant at that place, and will soon begin the manufacture of gas for fuel.

J. P. Witherow, the Pittsbugh furnace builder, left for Canada to-day to negotiate with a Canadian syndicate for the building of a $200,000 blast furnace in Ontario. The Canadian Government is backing the enterprise.—[Pittsburgh Dispatch.

Among the numerous new enterprises of the South is the project of establishing a blast furnace at Athens, McMinn county, Tenn. The scheme has much to commend it. All the raw materials are near at hand, and railroad facilities are excellent. Mr. J. D. Kase, of Danville, Pa., is prominent in the movement.

Secretary Dowling, of the Chamber of Commerce, Sault Ste. Marie, Mich., is in communication with G. E. Beach, the mechanical and hydraulic engineer, who, as agent for an Eastern rolling mill company, is in search of a site. The mill is to have a capacity of 20 tons of merchant iron daily, and the proprietors are anxious to learn what inducements the city will offer.

A Jefferson (Texas) dispatch says: The first consignment of machinery for the great Lone Star Iron Works arrived this morning. There was a great deal of talk about the company falling through, but this has set the thing moving. Before the first of January, 1890, Jefferson will have the largest iron works in the State of Texas. Already the contract for the burning of 2,000,000 brick for the furnace has been let.

The gentlemen who propose to erect and operate a stove foundry at Fort Worth, Texas, are M. A. McLaughlin, of Manhattan, Kan; W. H. Vanderworker, of Green Island, N. Y., and J. V. Vrooman, of Schenectady, N. Y. They have bought eighteen acres of land, one-fourth of a mile west of Fort Worth, on the Texas & Pacific, and Messrs. A. M. Carter, J. J. Roche and C. Y. McClellan have donated fifteen acres. They propose and guarantee to expend $50,000 in buildings of brick and machinery. The foundry will have capacity sufficient to employ 100 hands.

From a Pittsburgh dispatch to the New York *Tribune* we condense the following: Large iron, steel and aluminum works are now in progress of erection at West Park, near Findlay, O. A syndicate of New York capitalists have just completed negotiations for the purchase of 520 acres of land, and more is to be bought within a short time. On the 2d instant the company broke ground for the erection of 1,500 model dwelling houses for the accommodation of the employes. The company, it is said, has a capital stock of $6,000,000. The general manager of the syndicate was in West Park recently, superintending the construction of four immense crucibles, in which the aluminum will be made. It has been proved that the clay in this part of Ohio is the most desirable for the manufacture of the new metal, and that fact was the chief inducement that led the company to build its plant at West Park. The product is to be used in the construction of certain machinery, but principally to manufacture structural works. It is said that the contracts for the works and the machinery have already been let. The dwelling houses are to be finished by next spring, when the works will be started. The intention is to have in the one plant the capacity for producing all the necessary parts of the machinery, of which the new metal will form a part. Aluminum cannot be used economically in all portions of the work, so the iron and steel will be worked in the same mills."

Enlargements, Additions, Removals, etc.:—

Possibility of the Sligo Rolling Mill of Phillips, Nimick & Co., Pittsburgh, will be removed to Connellsville.

The Cleveland Rolling Mill Co. has purchased several acres of land adjoining its wire mills, with a view to probable extensions.

The Thomas Furnace Co., of Niles, O., have expended nearly $50,000 the present year making improvements to their plant.

The Illinois Steel Co. is constructing a new blast furnace at Joliet. It is to be of the largest capacity, and is being erected adjoining the two old furnaces which are now in full blast.

Lane Manufacturing Co., Montpelier, Vt., manufacturers of wood-working machinery, are erecting a new foundry building, 130x60 feet, with a wing 30x60 feet, to be used as a store-room for coal and iron; also an engine and boiler room 30x60 feet, and a molding room 84 by 30 feet. These improvements will be completed in a few months, and will double the capacity of the works. More additions are planned for next year, which will include a new machine shop.

The business of the Cambridge Roofing Co., of Cambridge O., has increased to such an extent that they have been obliged to enlarge their factory, and increase their facilities. Their new building is a two-story 84x40, which gives them an additional floor space of over 6,000 square feet, and they are now in better shape than ever before to meet the demands of the trade. Their specialty is Crowl's patent steel roofing. They will soon issue a supplement catalogue.

C. S. Bell & Co., Hillsboro, O., write us that they have secured a new location for their works, and will erect a foundry building 100′x100′, machine shop 200′x50′, two stories high. The buildings are to be covered, side and roof, and new boiler and engines will be put in. The plans are ready and contracts will be let between now and October 1st. Messrs. Bell & Co. manufacture cane mills, evaporators, steel alloy bells, Mogul stoves, etc.

Fires and Accidents :—

Homestead, Pa.—A very serious accident attended with loss of life occurred at the Homestead (Pa.) Steel Works of Carnegie, Phipps & Co., Limited, on the afternoon of the 30th ult. The accident occurred in the open-hearth department, when an immense ladle containing 30 tons of molten steel boiled over, throwing the liquid metal over the pit men. Five men were so severely burned that they died a short time after, and three others were also severely burned.

Yaquina City, Ore.—The Oregon Pacific Railroad Co.'s Foundry. Loss $20,000.

Kansas City, Mo.—Kansas City Nut & Bolt Co., located at Sheffield, near Kansas City, Mo. Loss, $18,000; insured.

General Industrial Notes :

The Pottstown (Pa.) Iron Co. announced an increase of puddlers' wages from $3.25 to $3.50 per ton, to take effect on the 16th inst. About 500 men are interested.

Messrs. Gerlach & Son, Cleveland, manufacturers of saw mill machinery, etc., report business prospering. They are among the oldest and most reliable firms in this line in the country.

The new engine, which is being put in place in the New Castle Wire Rod Mill, is said to be among the very largest engines in this section. It has a capacity of 3,000 horse-power when exerted to its utmost limit. The power is transmitted by a belt from the fly-wheel, the rim of which is 3 feet wide. The wheel itself is 20 feet in diameter, weighs 39,000 pounds, and revolves with an average speed of 120 revolutions each minute. This one engine supplies the power for the entire plant, and is furnished with steam by two huge porcupine boilers. Gas fuel will be used in the boilers, the gas being made at the works by two large generators, a house for which is being built alongside the boilers. The huge engine is of the Cooper-Allen manufacture, and is from the shops in Philadelphia.—[New Castle (Pa.) Guardian.

Important Contracts Secured:—

The Walker Manufacturing Co., Cleveland, has been awarded the contract for cable winding machinery for the Valley City Street & Cable Railway Co., of Grand Rapids, Mich.

The contracts for the Carnegie gas line from the Bellevernon field to Pittsburgh, via Edgar Thomson Works, have been let, and aggregate from $200,000 to $300,000. The pipe contract was awarded to the Pittsburgh Tube Co. This line is being built as an emergency line in case the Murraysville field fails. The Carnegies will sink three or four wells at first, and may sink others as increased fuel supply is needed.

The Brown Hoisting & Conveying Co., Cleveland, are placing one of their hoists at West Superior, Minn., for the Ohio Coal Co. They are also placing one of their plants at Fairport, O. This hoist will be used for handling ores on the Pennsylvania & Lake Erie docks. They have lately completed a plant at Piedmont, on the Hudson, for the Lake Erie & Western Railroad. This plant will be used in handling coal. All these plants are about the same as those in operation on the N. Y., P. & O. R. R. docks at Cleveland. This firm is also building a cantilever derrick for Jones & Laughlin, Pittsburgh; length of booms 306 feet. This derrick will be used for general purposes, in the yard of the above-named firm. The company report trade good, and they are running over time.

The Manufacture of Cow-Bells.

There are four establishments in this country devoted exclusively to the manufacture of these resonant articles, and two of them are in Collinsville, Ill. One hundred and fifty dozen are turned out daily, and thousands of them dangle from the necks of unfortunate cows all over the prairies of North and South America. The manufacture of cow-bells is entirely distinct from that of other bells. Instead of being molded, the metal is rolled into sheet, cut into symmetrical polygons, which, when folded, are pressed into their well-known form. Having been riveted, they are next packed in clay, and brought to a white heat. When suddenly cooled these steel bells are found to be not only tempered, but also beautifully brazed.

Cost of a Locomotive.

One man can build an eight-wheel passenger locomotive for a standard gauge railroad in 1,500 days; it will require 1,650 days' work for him to build a consolidated ten-wheel locomotive for a standard gauge. The wages for skilled labor run from $2 to $4.50 a day; this would give an average of $3.09 a day, or $4,635 for the engine. The cost of the necessary metal to build a locomotive is usually estimated at about $2,000. The profit may be put down at another $2,000, which would include the expenses of sale and delivery. This would make an engine, when absolutely ready for service and complete in every way, worth about $8,635.

A Big Melt of Steel.

Oliver Bros. & Phillips have made an extraordinary run of steel in their converting mill at the foot of South Thirteenth street. One day last week they melted 148,800 pounds of scrap steel in one cupola in 24 hours. This is claimed to be the best record ever known. The average run in one cupola is about 82,000 pounds. In the same time 414,000 pounds of iron was melted. The melt reflects great credit on the superintendent of the mill, George W. Bryan, who is an old Edgar Thomson man. The mill is now running triple turn.—[Pittsburgh Dispatch.

Harvest Excursions.

On September 10th, 24th and October 8th, 1889, the Pennsylvania lines west of Pittsburgh will sell excursion tickets, at one fare for the round trip, to principal points in the Northwest, West, Southwest and South, good returning thirty days from date of sale. For full information apply to Bingham & Douglass, Weddell House corner.

SHIP-BUILDING.

Cleveland's Place as a Ship-building Center.

Cleveland stands second to no city on the lakes as a ship-building center, and especially is she noted for the number of fine steel steamships that have been recently turned out. Some idea of the magnitude of this industry can be gained when it is stated that 58 large vessels, many of which are of the finest boats on fresh water, have been launched at this port since the year 1885. These boats represent something like $7,000,000 of capital. Placed end to end the boats built here during the last five years would reach three miles, and they represent a net tonnage of 67,000 tons.—[Cleveland Press.

The Largest Steel Lake Barges Yet.

Both steel vessels to be built by the American Steel Barge Co., this Winter, will be begun in a short time at the Rices Point ship-yard of the company. These ships are to be constructed on even a larger scale than the 102 and 103, one of which is now in successful commission, while the other will be off the stocks in less than four weeks. As has been stated, a large bill of material for the 104 has been ordered of the several steel plate manufacturers in the East, who are in the enjoyment of orders from the American Steel Barge Co. In addition to this, orders for the steel for the 105 will soon be forwarded, and a short time after the 103 is off the stocks, the keel of the 105 will be laid. Thus two great vessels will be under construction during the Winter. While the 102 and 103 are about 260 feet long, the 104 and 105 will be not less than 300 feet in length, over all. While the largest ships in commission on the lakes at present have a capacity of about 3,000 tons, and in this list the former vessels of this company figure at the head, these new steel freight carriers will each have a much greater freight capacity, the 40 feet additional hold being all 'midships, where it counts. They will be, therefore, by far the largest vessels on the lakes, for while there are longer, wider and higher ships of the old-style build, there is nothing that will compare with these in carrying capacity. The company will employ between 250 and 300 men all Winter, and by Spring will have 17,000 tons capacity in the water, all built on Capt. McDougall's patterns and under his direction.—[Duluth Herald.

The World's New Tonnage in 1887 and 1888.

The "Universal Register" for the current year, recently published by the Committee of Lloyd's Register of British and Foreign Shipping, contains the following interesting table showing aggregate number and tonnage of all vessels built in the respective countries enumerated during the years 1887 and 1888:

	1887. No. of Vessels.	1887. Tonnage.	1888. No. of Vessels.	1888. Tonnage.
United Kingdom	329	477,107	484	776,993
Germany	27	23,111	37	39,994
United States	68	38,673	73	38,198
British colonies	39	12,220	68	17,106
Norway	6	2,328	19	11,433
France	12	10,251	14	10,721
Denmark	5	2,485	5	5,721
Netherlands	2	717	3	5,156
Austria	2	570	5	5,038
Sweden	13	3,095	15	4,088
Greece	9	2,253	15	3,086
Italy	9	1,252	8	1,798
Russia	14	3,432	7	1,713
Other countries	4	2,255	12	5,478
Totals	539	579,779	765	926,523

As compared with 1885, there had been an increase in the output of all the ship-builders in the world in the year 1887 of 16,697 tons. The comparative results of the last two years are widely different, there being an increase not only in the tonnage, but also in the number of vessels—viz., 226 vessels and 346,744 tons. In one year for the output of ship-builders to be increased by 60 per cent. is certainly remarkable.

LIST OF PATENTS.

Relating to Iron, Steel, Metal, Machinery, Hardware and Mining Interests.

Reported expressly for this paper by H. T. Fisher, (late Ex. U. S. Patent Office), Patent Attorney, 34 Blackstone Building, Cleveland, O.

PATENTS BEARING DATE SEPTEMBER 13, 1889.

Aluminum, producing, M. Wanner, Robinson, Col.
Belting, wire, T. Midgley, Beaver Falls, Pa.
Metals from their ores, solution for use in separating, J. C. Wiswell, Medford, Mass.
Pipe, making square metal, W. B. Sanford, Kewanee, Ill.
Rolling bars into sheets, rolls for, E. D. Wassel, Pittsburgh, Pa.
Roofing, siding, etc, metallic, L. L. Sagendorph, Cincinnati, O.
Sheet metal pipe, H. L. Gates, Milwaukee, Wis.
Steel direct from the ore by the use of natural gas, W. F. M. McCarty, Hagerstown, Md.
Wire, apparatus for coiling galvanized, J. Coffin, Johnstown, Pa.
Wire, continuously annealing and plating, J. Coffin, Johnstown, Pa.
Wire, manufacture of, E. Martin, Paris, France.

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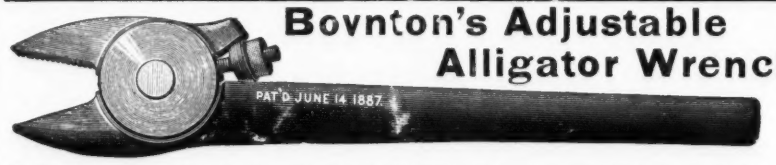

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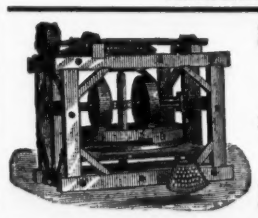

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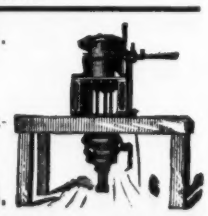

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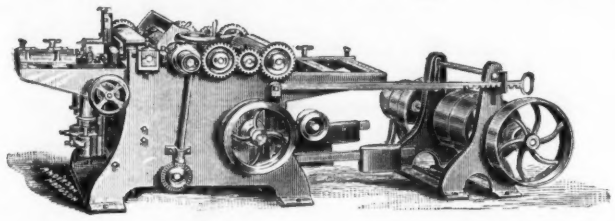

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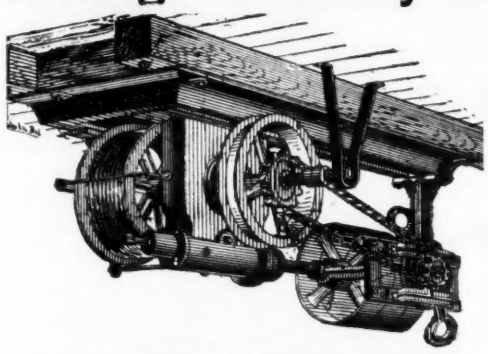

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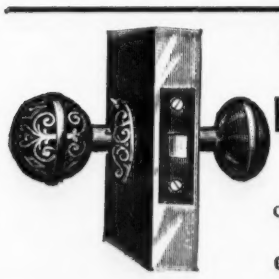

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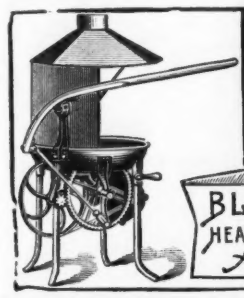

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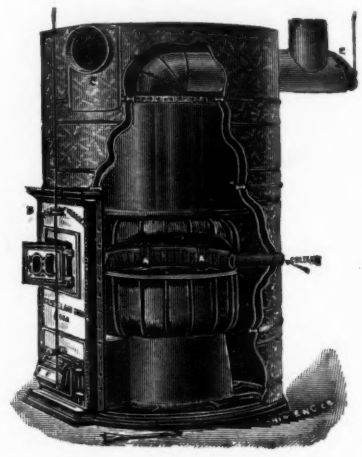

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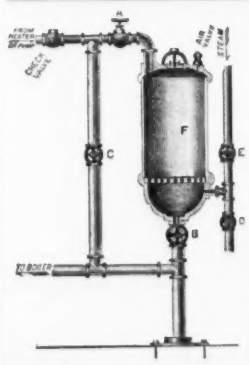

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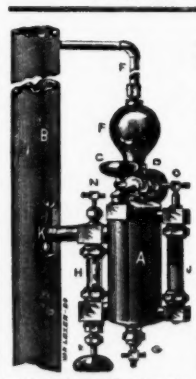

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CHICAGO (reported by Rogers, Brown & Co.): COKE AND BITUMINOUS—Ohio H. R. Strong Softeners, No. 1, $18 00@00 00; Ohio H. R. Strong Softeners No. 2, $17 00@00 00; Ohio Jackson Co. pure Softeners No. 1, $17 50@00 00; Ohio Jackson Co. pure Softeners No. 2, $16 50@00 00; Ohio Shawnee Valley, Pure Softeners No. 1, $17 00@00 00; Ohio Shawnee Valley, Pure Softeners, No. 2, $16 00@00 00; Ohio Black Band Softeners No. 1, $18 00@18 50; Ohio Black Band Softeners, No. 2, $17 00@17 50; Local Brands, No. 1, $16 00@00 00; Local Brands, No. 2, $15@00 00; Local Brands, No. 3, $14 00@00 00; Southern Coke, No. 1, Foundry $16 50@00 00; Southern Coke, No. 2 Foundry, $15 50@00 00; Southern Coke, No. 3 Foundry, $14 50@00 00; Southern Coke, No. 1 Softeners, $15 50@15 75; Southern Coke, No. 2 Softeners, $00 00@00 00; CHARCOAL FOUNDRY—Lake Superior, Nos. 1 and 2, $18 50@19 00 Hanging Rock, $20 00@23 00; Southern Alabama, $19 00@22 00; Southern Tennessee, $18 00@19 00. CAR WHEEL AND MALLEABLE—Lake Superior Nos. 2 to 6, $18 50@19 50; Standard Alabama, $23 00@24 00; Standard Tennessee, $19 00@20 00; Hanging Rock, Cold Blast, $26 00@00 00; Hanging Rock, Warm Blast, $21 00@23 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and Southern Coke No. 1, $15 25@15 50; Ohio and Southern Coke No. 2, $14 50@14 75; Ohio and Southern Coke No. 3, $14 00@14 25; Ohio Soft Stone Coal No. 1, $15 75@16 50; Ohio Soft Stone Coal No. 2, $14 75@15 50; Mahoning and Shenango Valley, $00 00@00 00; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $17 50@18 50; Tennessee and Alabama Charcoal No. 2, $16 50@17 50. FORGE—Strong Neutral Coke, $13 50@13 75; Mottled Neutral Coke, $13 00@13 50; Cold Short Coke, $13 00@12 50. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Nock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $15 00@15 50; Southern Coke No. 2 Foundry (new classification), $14 50@15 00; Southern Coke No. 3 Foundry (new classification), $13 75@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $12 75@13 25; Silver Grey, different grades, $13 25@13 75; Southern Charcoal No. 1 Foundry, $16 50@17 00; Southern Charcoal No. 1 Mill, $15 00@15 50; Southern Car Wheel, Standard brands, $22 00@23 00; Southern Car Wheel, other brands, $18 25@19 75; Hanging Rock Coke No. 1 Foundry, $15 75@16 25; Hanging Rock Charcoal No. 1 Foundry, $19 75@21 25; Hanging Rock Cold Blast, $21 00@23 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $14 75@15 25; Southern coke No. 2, $14 00@14 50; Southern coke No. 3, $13 75@14 25; Mahoning Valley (Lake ore mixtures), $17 50@18 00; Southern charcoal, No. 1, $16 50@17 00; Southern charcoal, No 2, $16 00@16 50; Missouri charcoal, No. 1, $17 50@18 00; Missouri charcoal, No. 2, $17 00@17 50. FORGE—Neutral coke, $13 25@13 75; Cold short, $13 00@13 25; Mottled, $12 00@12 25. CAR WHEEL AND MALLEABLE—Southern (standard brands), $21 50@22 00; Southern (other brands), $17 50@18 00; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 00@16 75; Southern Coke No. 2, $15 00@15 75; Southern Coke No. 3 $14 50@14 75; Southern Grey Forge, $14 00@14 50; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@18 00; Missouri Charcoal No. 1, $16 00@16 50; Missouri Charcoal No. 2, $15 00@16 00; Ohio Softeners, $17 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@22 00; Southern, $19 00@23 00. CONNELLSVILLE COKE—East St. Louis, $4 85; St. Louis, $5 00.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 25@17 50; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 25 $17 50; Niagara No. 1, $17 25@00 00; Niagara No. 2, $16 25@00 00; Niagara No. 3, $15 75@00 00; Ohio Softeners No. 1, $17 25; Silvery Soft, No. 1, $16 50@17 50; Southern Coke No. 1 soft, $16 75@17 00; Southern Coke No. 2 soft, $15 75@16 00; Lake Superior Charcoal, $19 00@20 00; Tennessee Charcoal, $18 75@19 25; Alabama Car Wheel, $24 00@25 00; Hanging Rock Charcoal, $23 00@24 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 25@19 75; Lake Superior Coke, all Ore, $18 50@19 50; Lake Superior Coke, Cinder Mixed, $17 50@18 50; Standard Ohio Black Band, $18 00@18 50; Southern No. 1, $17 00@17 50; Southern Gray Forge, $15 50@16 00; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $18 00@18 50; Old Wheels, $18 00@19 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 25@17 50; No. 2 Foundry, $16 25@16 50; Grey Forge, $15 50@15 75; White and Mottled, $14 25@14 50; Warm Blast Charcoal, $18 00@25 00; Cold Blast Charcoal, $24 00@28 00; Bessemer, $17 75@18 00.

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4¼ to 6 by ⅜ to 1 inch	1 85
1¼ to 6 by 1⅛ to 2 inch	2 15
1¼ & 1⅜ by ⅜ to ¾ inch	1 85
1 & 1⅛ by ⅜ to ¾ inch	1 85
⅝ ¼ and ⅞ by ⅜ to ⅝ inch	2 25

Round and Square.

1 to 1⅞ inch	1 75
2 to 2⅝ inch	1 95
2¼ to 3¼ inch	2 25
3⅜ to 4 inch	2 75
4¼ to 4½ inch	3 25
4¾ to 5 inch	3 45

Oval.

⅞ to 1¼ inch	2 15
⅝ to ¾ inch	2 35
½	2 55
⅜	2 95

Half Oval and Half Round.

1½ to 3 inch	2 85
⅞ to 1¼ inch	2 45
⅝ to ¾ inch	2 95
½	3 25
⅜	4 75

Heavy Band.

½ to 6 by ¼ and 5-16 inch	1 95
⅞ to 1⅜ by ¼ and 5-16 inch	2 05
¾ to ⅞ by ¼ and 5-16 inch	2 25
½ to ⅝ by ¼ and 5-16 inch	2 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 55
1¼ to 2, Nos. 16 to 18	2 65
1¼ to 2, No. 19	2 75
1¼ to 2, No. 20	2 85
1¼ to 2, No. 21	2 95
1¼ to 2, No. 22	3 05
15-16, 1 and 1⅛, Nos. 13 to 15	2 75
15-16, 1 and 1⅛, Nos. 16 to 18	2 85
15-16, 1 and 1⅛, Nos. 19 and 20	2 95
15-16, 1 and 1⅛, No. 21	3 05
15-16, 1 and 1⅛, No. 22	3 25
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	2 95
⅞, Nos. 19 and 20	2 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
¾, Nos. 16 to 18	3 35
¾, Nos. 19 and 20	3 45
¾, No. 21	3 55
¾, No. 22	3 65
11-16, Nos. 13 to 15	3 45
11-16, Nos. 16 to 18	3 55
11-16, Nos. 19 and 20	3 65
11-16, No. 21	3 75
11-16, No. 22	3 85
⅝, Nos. 13 to 15	3 85
⅝, Nos. 16 to 18	3 75
⅝, Nos. 19 and 20	3 95
⅝, No. 21	4 05
⅝, No. 22	4 15
⅝, No. 23	4 25

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in.	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅛ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 55
No. 15 to 17	2 75
No. 18 to 21	2 85
No. 22 to 24	2 95
No. 25 to 26	3 05
No. 27	3 15
No. 28	3 35

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 40
C No. 1, " "	2 65
C H No. 1 " "	2 90
C H Flange, " "	3 60
Extra Flange, "	4 00
Solid Fire Box, "	4 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 55
Shell	2 95
Flange	3 20
Marine Flange	3 70
Fire Box	4 35

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3½ to 4 in	11
⅝ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

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2 to 9-16 wide by 2 to ⅛ thick	9

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	ct. ℔
Machinery	base price, 02¼
Tire	" 02¾
Spring	" 03¼
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$17 50
No. 1 wrought scrap	15 50
No. 1 Machine cast scrap	12 50
Stove Plate (free from burnt iron)	9 50
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Iron axles	23 00
Axle turnings	13 00
Wrought turning (free from cast)	11 50
Wrought drillings	11 00
Cast borings	8 50
Malleable iron	9 50
Uncut wrought iron boilers	10 00
Steel boiler plates	10 00
	GROSS TONS
Old iron T rails	22 00
Old steel rails	17 00
Old car wheels	17 00
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

DALLIBA, CORRIGAN & CO.,

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—AND—

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EXCLUSIVELY PIG IRON,

Strong Foundry and American Scotch Irons, Gray Forge and Bessemer Irons for steel purposes.

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MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

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IAS. PATTERSON, Sales Agent.

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Moline, Illinois,

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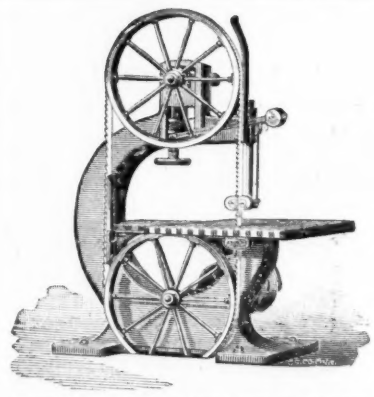
DOUBLE AND SINGLE

Punch and Shears,

THE IMPROVED

Justice Spring Hammer.



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$500 will buy the best 7 ft. Band Mill in the world.

$185 will buy our new patent band re-sawing machine.

$100 will buy the best automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw. For further particulars address

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CLEVELAND DESK CO.

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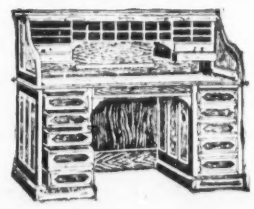

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—AND—

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Engineers Don't be Deceived. The Cyclone Steam Flue Cleaner is the only Cleaner made giving steam a spiral motion the entire length of the tubes.

CRESCENT MFG CO., Cleveland, O.

MACHINERY SUPPLY MARKET.

Anvils.

American ..... ℔ lb 9@10
Wrights ..... ℔ lb 9½

Bellows.

Blacksmiths' { Hill's ..... dis 40 / Bullock's .... dis 50&10
Moulders' ..... dis 40@40&10
Hand ..... dis 40&10@50

Belting.

Boston Belting Co's standard ..... dis 70@70& 5
" " " extra ..... dis 60&5@60&10
" " " best ..... dis 55
Hoyt's Short Lap ..... dis 45
Cleveland Rubber Co. extra standard dis 60&10
Shultz Raw Hide Leather Belting, single, ... dis 30
Shultz Raw Hide Leather Belting, double, ... dis 35
Standard, oak tanned ..... dis 55@60
Alexander Brothers' pure oak tanned. ... dis 45

Blowers and Exhausters.

B. F. Sturtevant's ..... dis 20
Boston Blower Co. ..... dis 35
Buffalo ..... dis 35

Borax.

..... ℔ lb 9½@10½

Chalk.

White ..... ℔ gross 50
White Crayon ..... ℔ gross 12@12½ dis 10
Red ..... dis 70
Blue ..... dis 85

Chucks.

Cushman's 4 Jaw Independent ..... dis 40
" Combination ..... dis 40
" Geared Scroll ..... dis 30
" 2 Jaw Brass Workers. ..... dis 25
" Drill ..... dis 35
Wescott's Scroll Combination ..... dis 30
" Independent ..... dis 40
" Little Grant Drill ..... dis 30
Horton's Universal & Ind ..... dis 40
National Combination ..... dis 40
Sweetland " ..... dis 40
Skinner " ..... dis 40
" Independent ..... dis 40
Almond Drill ..... dis 25
Morse " ..... dis 15
Skinner " ..... dis 30

Cutters and Reamers.

Cleveland ..... dis 10@15
Pratt & Whitney ..... dis 10@15
Standard ..... dis 10@15
Brown & Sharpe, Milling Cutters ..... dis 15
" " Gear Cutters ..... dis 15

Crowbars.

Cast Steel ..... ℔ lb 4
Iron, steel points ..... ℔ lb 3½

Drill and Drill Stocks.

Twist drills ..... dis 50&10
Morse Taper and Straight shank to 1½" ..... dis 50&10
Morse Taper and Straight shank Larger than 1½" ..... dis 25
Drill Sockets ..... dis 25
Standard ..... dis 50&10
Cleveland ..... dis 50&10
Maneer's bench ..... dis 50&25
Maneer's post ..... dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ℔ lb	4 c	5 c		2½c
½ kegs ℔ lb	4¼c	5¼c		2¾c
¼ kegs ℔ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7¼c

Emery Cloth and Paper.

Barder, Adamson & Co. ..... dis 40@46
H. H. Barton ..... dis 40@46

Emery Wheels.

Detroit ..... dis 50@60
Norton's ..... dis 55@60
Grant ..... dis 55@60
Union Stone ..... dis 60
Sterling ..... dis 60
Vulcanite ..... dis 15@20
Celluloid ..... dis 10
Northampton ..... dis 55
Crystal ..... dis 65@70
Vitrified ..... dis 60

Files.

Nicholson ..... dis 60&10@60&10&10
" X. F. ..... dis 25
Kearney & Foot ..... dis 60&10@60&10&10
Black Diamond ..... dis 60&10@60&10&10
Arcade ..... dis 65@70
Disston's ..... dis 65@70
Western ..... dis 70
Stub's ..... dis 25
Grobet's ..... dis 30
Reynolds Bros.' Hand Cut ..... dis 50

Hammers.

P. S. W. ..... dis 40
Atha new list, Jan. 15, 1887 ..... dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list ..... dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ℔ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887 ..... dis 70 &10
Standard Penny Nails, ℔ keg card rate
{ Car lots ..... $2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin ..... dis 60
Brass and Copper ..... dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ℔ doz ..... dis 10@10&10

Packing, Steam.

Boston Belting Co. ..... dis 60
American Packing Hemp ..... ℔ lb 10@11
Russia Packing " ..... ℔ lb 14
Italian Packing " ..... ℔ lb 13@14
Plumbago Piston ..... ℔ lb 40
Morrison's " ..... ℔ lb 50
Square Flax " ..... ℔ lb 70
Sheet Rubber ..... ℔ lb 12@24
Excelsior Rubber ..... ℔ lb 48

Picks.

Railroads, 5 to 6 lbs ..... $12 dis 60
" 6 to 7 lbs ..... $13 dis 60

Pulleys.

Iron Pulleys, Walker List ..... dis 45
Medart Pulleys ..... dis 55
Split Wood Pulleys ..... dis 45

Rivets.

Iron, Thousand, list November 17, ... dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17 ..... dis 50
Copper ..... dis 50@50&10

Rope.

Manilla, ½ inch and over ..... ℔ lb 15¼
Sisal, ½ inch and over ..... ℔ lb 13¾

Sand Paper.

B. A. & Co ..... dis 40@40&10
H. H. Barton's ..... dis 40@40&10
New England Flint ..... dis 40@40&10
Barton's Garnet ..... dis 25

Saws.

Disston's Circular ..... dis 45
" Band ..... dis 20
" Scroll ..... Net
Hack Saw Stubs ..... dis 20
" " Eureka ..... dis 20
" " Star ..... dis 20
Saw Swages Disston's ..... dis 20
Atkins' Cicular Saws ..... dis 50
" Mill, Mulay and Drag Saws .. dis 40&10
" Wood Saws ..... dis 40&10
" Silver Steel Diamond Cross-cut Saws ..... dis 70c per ft
" Dexter Cross-cuts ..... dis 50c "
" Diamond " ..... dis 30c "
" Tuttle Tooth Cross-cuts .. dis 25c "
" One-man Cross-cuts ..... dis 32c "
No. 1 Handles ..... dis 23c per pair
No. 6 " ..... dis 16c "
Excelsior Saw Tools ..... $6 per doz
Perfection " ..... $15 "

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron ..... dis 50
Round head iron ..... dis 40
Flat head brass ..... dis 45
Round head brass ..... dis 35
Square Cap ..... dis 65
Hexagon Cap ..... dis 60
Set C. H. C. P. ..... dis 70
Machine, flat head, iron ..... dis 55
Machine, round head, iron ..... dis 50
Bench and hand—
Lag or coach ..... dis 75@75&10
Coach, patent gimlet point ..... dis 75

Shovels and Spades.

Ames' list November 1, 1885 ..... dis 20
Dennis ..... dis 5.25
Hussey & Binns, railroad ..... dis 8.00

Taps.

Cards, Hand and Nut to 2 in ..... dis 50
Carpenters' " " " ..... dis 50
Morse " " " ..... dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps ..... dis 55
Pipe Taps to 2½ in ..... dis 70
Stay Bolt Taps ..... dis 25
Stove Bolt Taps ..... dis 50
Pulley Taps ..... dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ½ "	18c@28c	
No. 36 " " ¼ and ½ "	16c@27c	
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12¼c	
3-Ply " 1½ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box ..... dis 60
Parker's ..... dis 20@25
Prentiss ..... dis 20
Stephen's ..... dis 25@30
Barrett's ..... dis 30
Miller's Falls ..... dis 40
Merrill's ..... dis 10@15
Howard ..... dis 30
Maneer's machinist ..... dis 50&10

Wire.

New List, Jan. 18, 1884

Brass and copper ..... dis 20@25
Bright and annealed, Nos. 0@18 ... dis 70&10@75
" " Nos. 19@26 .. dis 75@75& 5
" " Nos. 27@36 .. dis 75&10& 5
Coppered Nos. 0 to 18, market list .. dis 70@70& 5
Galvanized Nos. 0 to 18 " " ..... dis 65&5
Tinned market Nos. 0 to 18 ..... dis 67½
Cast steel ..... dis 50
Tinned Broom Wire ..... dis 70&5@70&10
Annealed Fence, Nos. 8 and 9 ..... dis 75
Annealed Grape, Nos. 10 to 14 ..... dis 75
Stub's Steel Wire regular ..... $6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days ..... dis 50
Girard Standard ..... dis 70&10
Agricultural ..... dis 75&10
Mechanics' ..... dis 55&10,& 3
Bemis & Call's Combination ..... dis 35
Donohue's Engineers ..... dis 20&10
Lamson & Sessions Engineers ..... dis 60
Billings & Spencer's Drop Forged ..... dis 10
William's " " ..... dis 10
Alligator " " ..... dis 40

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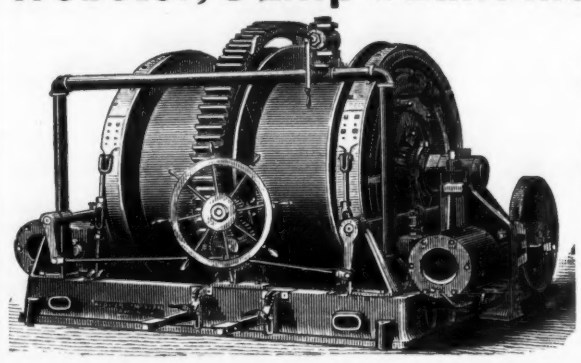
Improved Screw-Cutting FOOT or POWER LATHES.

Catalogue of Lathes, Drill Presses & Machinists' Tools and Supplies mailed on application. Lathes on Trial. 164 W. Second St., CINCINNATI, O.

Webster, Camp & Lane Machine Co.



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Mining Machinery,

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

(Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.

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"SPECIAL STAMPERS OF SHEET METALS."

We do **Stamping** and **Pressing** of Sheet Metals for all Classes of Work. Also **Tinning, Galvanizing** and **Japanning.** Also sole manufacturers of

Seamless Steel Buckets.

Ask your dealer for the Avery Patent Seamless Steel Elev. Bucket. **THE AVERY STAMPING CO.,**

Successors to The Avery Elevator Bucket Co
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Lubricator for Traction, Portable and all other small engines, pumps, &c. Single Connection.

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Unique Automatic
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Indorsed by Leading Engine Builders.

Manufactured under strong patents, the validity of which is acknowledged.

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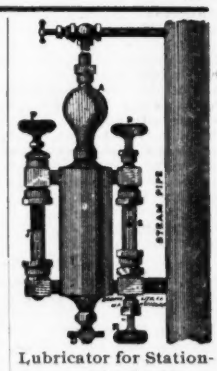
Mansfield, Ohio.

Active Agents Wanted. Special inducements offered Dealers and Jobbers.



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Castings

For Machinery and Rolling Mills.

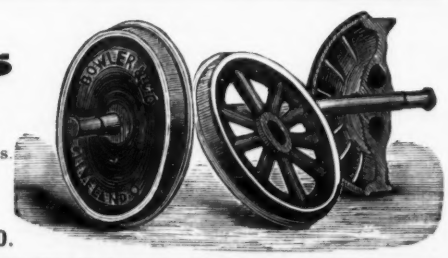
CAR WHEELS

All sizes and kinds, with and without Axles.

Chilled Faced R. R. Frogs

ST. RAILROAD TURNOUTS.

Nos. 9, 11 and 13 Winter Street. } BOWLER & CO.



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FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position, or for any service whatever.

60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.

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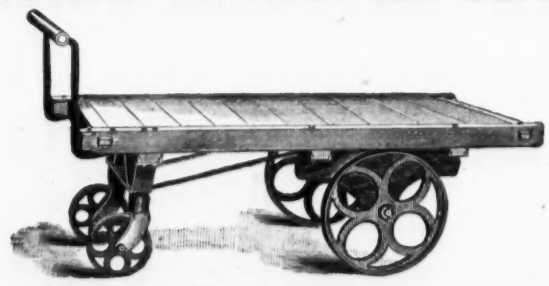

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Write for Catalogue of Iron, Steel and Wood Barrows and all styles of Trucks.

HARDWARE MARKET.

Augers and Bits.

ommon augers and bits.....dis 70
nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 00@6 50
Others.....₩doz. $5 50@5 75
Full polished.....$8 00

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 70@70&10
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6¼-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ lb5½@6
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in.. $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ₩ lb.	23	24	25	26	28	dis 25&10@25&10&10
Putnam, ₩ lb.	18	19	20	21	23	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65C@68C
Door Por. japanned.....dis 75C@78C
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers.dis 60&10@60&10&10
Pitcher spout, cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $5 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@40...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

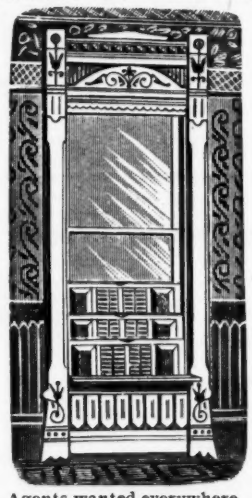
Steel and iron } dis 75&10@80
Nickel plated }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.

American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10&50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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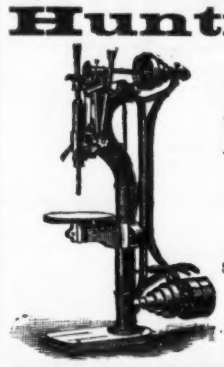

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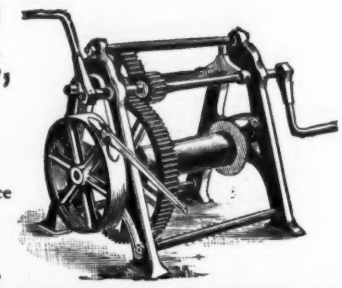

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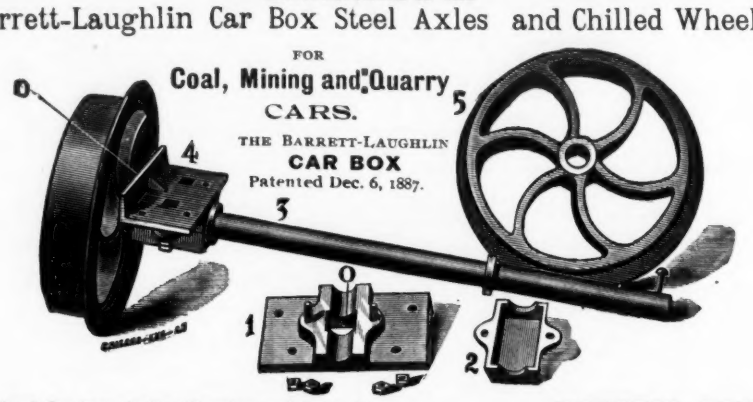

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Made of Sheet Metal. Sifts perfectly clean, no ashes accumulating in the center. Write to your nearest jobber for prices.

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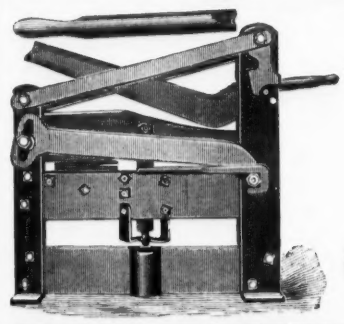

For Cutting and Punching Iron and Plow Steel.
This Machine will cut 4 x ⅝ Flat Iron and 1⅛ Round or Square, and Punch ⅜ hole through ⅜ Iron.
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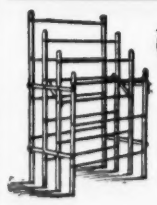

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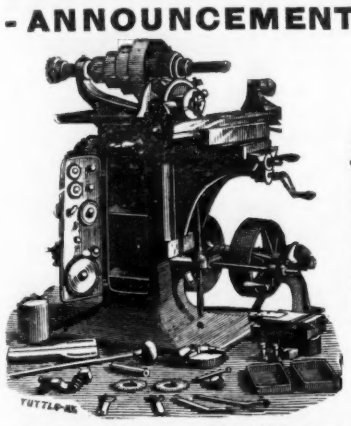

We received GOLD MEDAL for our New UNIVERSAL MILLER at the N. O. Exposition. (See cut.)

We have the pleasure of notifying our customers and friends that we have secured a long lease of the new building at Laight and Canal sts., and shall take possession about April 1.

Our new quarters contain about 45,000 square feet of floor room, and has light on three sides. We therefore shall have increased facilities for manufacturing and executing any orders that we may be favored with. Our plant will be a modern one, and all necessary tools for the proper and expeditious finishing of work will be introduced as fast as required

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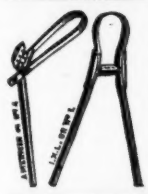

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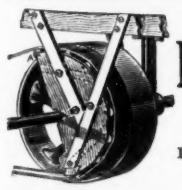

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Belt stops when machine stops and lies slack until machine starts. Simple, cheap, easily operated. Sent on approval. Thousands in use. Address

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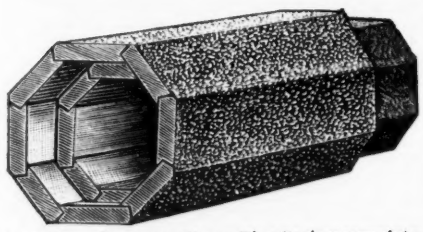

A section of our new Steam Pipe Casing complete.

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For Underground Steam Pipes.

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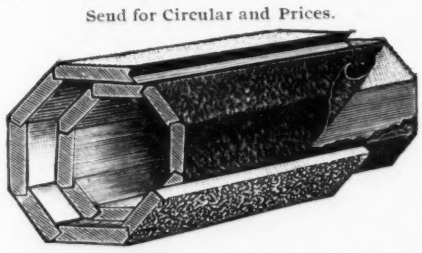

Two staves removed to show the lining between the inside and outside staves.

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Automatic Injectors,	**"**	**$5.00 up.**
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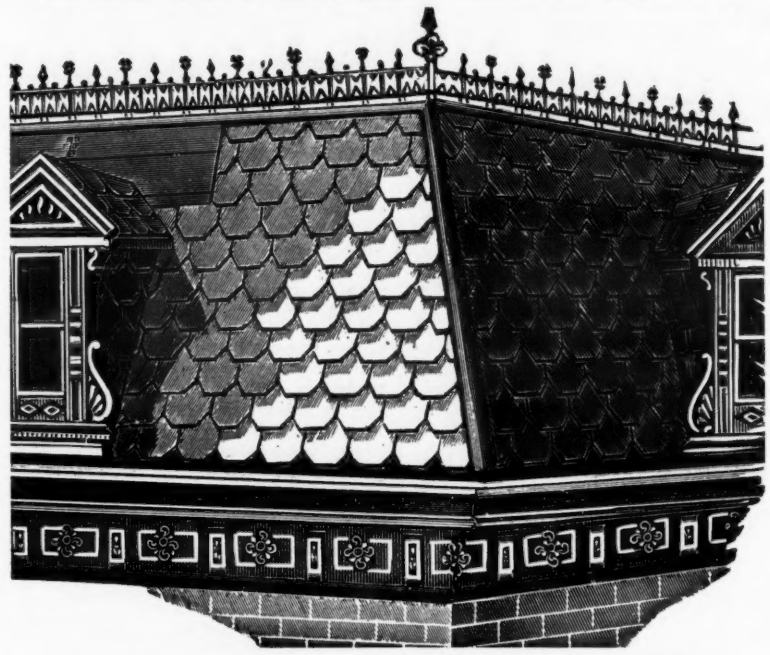

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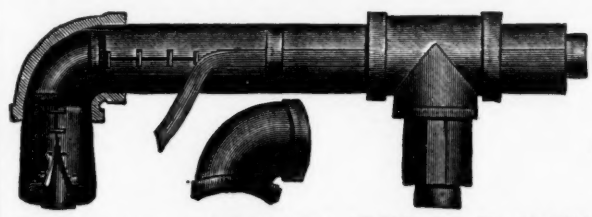

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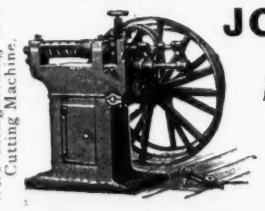

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Automatic Wire Straightening and Cutting Machines,

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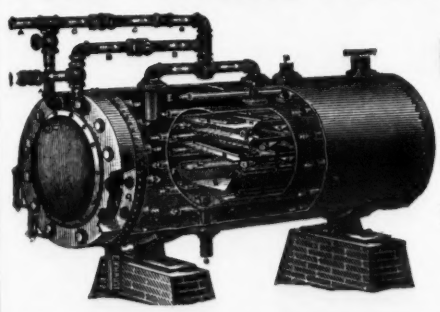

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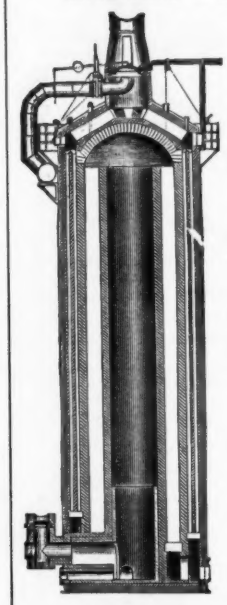

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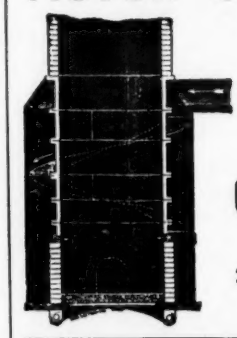

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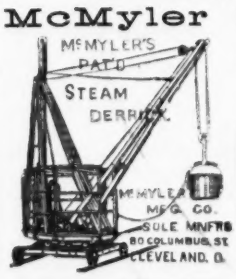

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Caldwell Manuf'g Co., Rochester, N. Y. 0

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland. 12

Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass. 19
A. A. Griffing Iron Co., Jersey City, N. J. 11

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Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn. 14

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Franklin Type Foundry, Cincinnati, O. 17

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland. 16

Saws—
E. C. Atkins & Co., Indianapolis, Ind. 20
Northwestern Saw Works, Toledo, O. 16
Standard Mfg. Co., Moore's Hill, Ind. 12
Peter Gerlach & Co., Cleveland. 11

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Standard Iron Co., Bridgeport, O. 19

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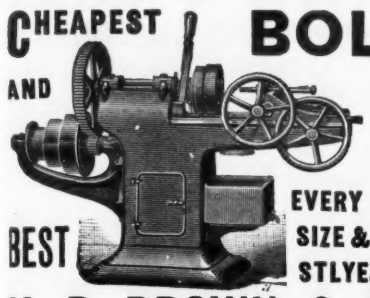

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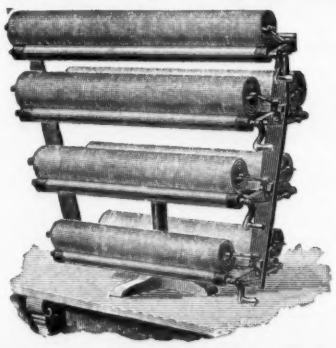

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Arranged to hold seven rolls of Wire of different widths; no trouble to load the Holder with Wire. Send for descriptive circulars and testimonials. Mention *The Iron Trade Review*.

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Detroit Steamer	†5 00 a. m.	10 00 p. m.

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FAST TIME. NO DELAYS.

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TRAVELERS' REGISTER.

Standard Time.
Revised March 6th, 1888.

N. Y., C. & St. L. R. R. Co.—"The Nickel Plate."

Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	8 00 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 40 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 05 p m
Akron & Orrville Accom	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom		†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:55 a. m., 3:05 p. m.
Canton—6:55 a. m., 3:05 p. m., 6:20 p. m.
Kent—6:55 a. m., *8:50 a m., 3:05 p. m., 6:20 p. m., *8:15 p. m.
Bedford—6:55 a. m., *8:50 a. m., 11:10 a. m., 1:30 p. m., 3:05 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 6:55 a. m., *8:50 a. m., 11:10 a. m., 1.30 p. m., 3:05 p. m., 4:40 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:25 a. m., 6:30 p. m.
Canton, 10:25 a. m., 2:35 p. m, 6:30 p. m.
Kent—*7:45 a. m., 10:25 a. m., 2:35 p. m., 6:30 p. m., *7:10 p. m.
Bedford—6:00 a. m., *7:45 a. m, 10:25 a. m., 1:05 p. m., 2:35 p.m., 4:15 p. m., 6:30 p.m., *7:10 p.m.
Newburgh—6:00 a. m., 7:10 a. m., *7:45 a. m., 10:25 a. m., 1.05 a. m., 2:35 p. m., 4:15 p. m., 5:35 p. m., 6:30 p. m., *7:10 p. m.
Canton and intermediate stations (Sundays only), 9:50 a. m., 6:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

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Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the 'canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

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The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the Southeast.

New Central Depot So. Water St. and Viaduct.

	Depart.
No. 62, Accommodation	† 6 05 a m
No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 25 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Jamest'n, Pitts. & Y'ngst'n Ex	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*10 05 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Youngstown Local	* 2 10 p m
No. 67, Pittsburgh Express	†12 30 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 8 55 p m
No. 73, Mantua Accommo	* 7 20 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

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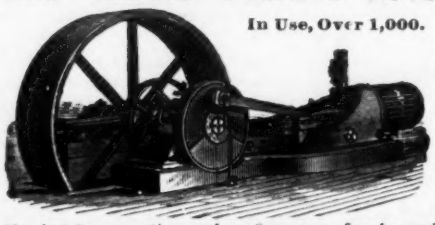

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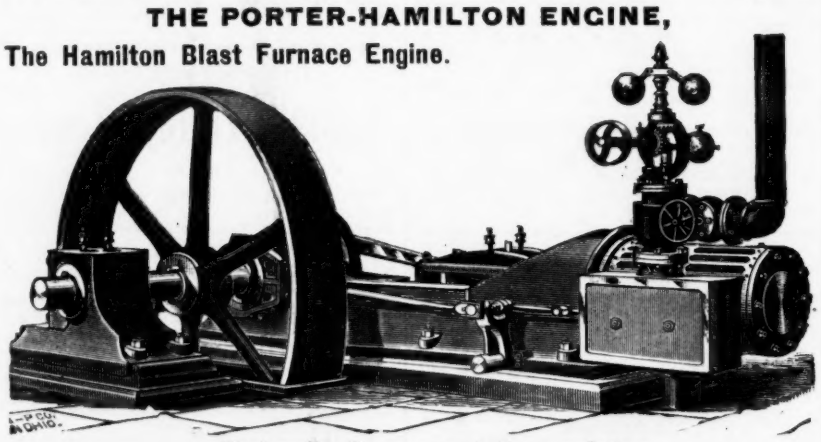

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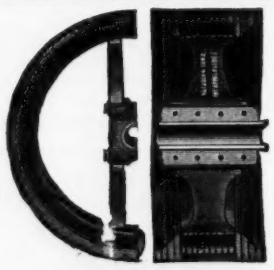

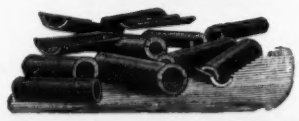

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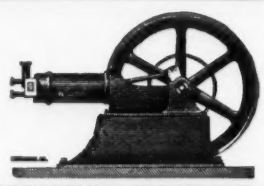

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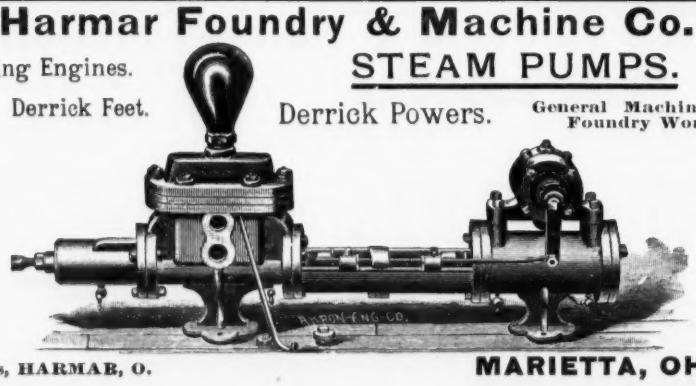

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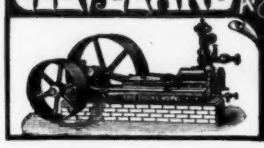

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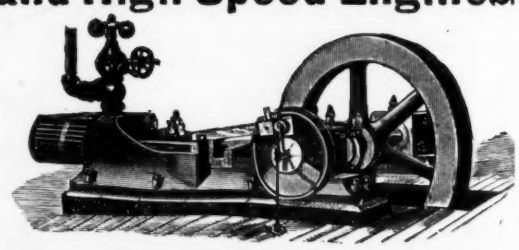

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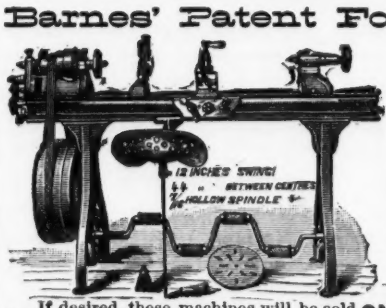

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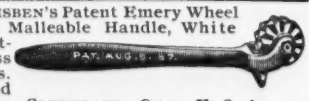

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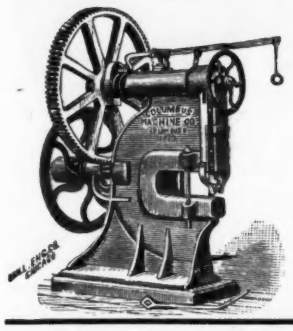

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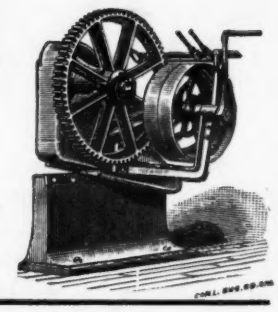

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P. S. S. The above train of thought was suggested to us by reading a circular issued by some enterprising firm located in some enterprising suburb of Cincinnati. Our memory is somewhat treacherous at times, but, to the best of our recollection, this enterprising suburb is called—PIQUA.

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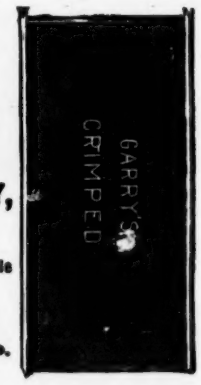

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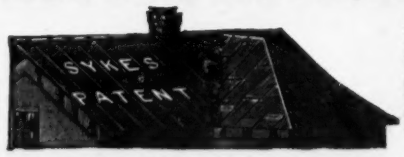

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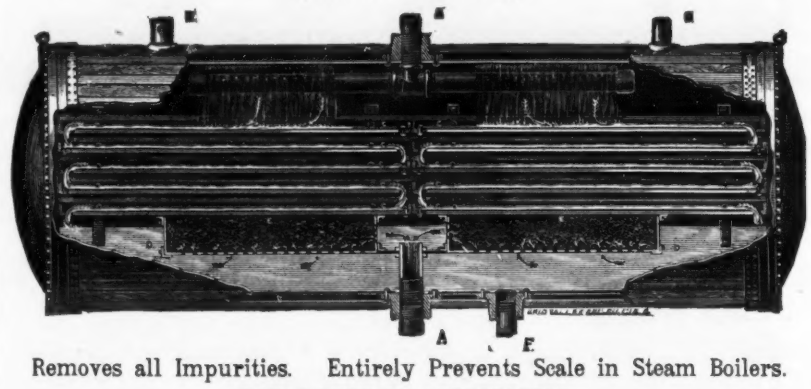

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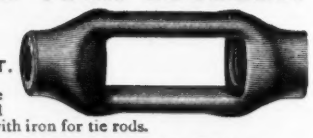

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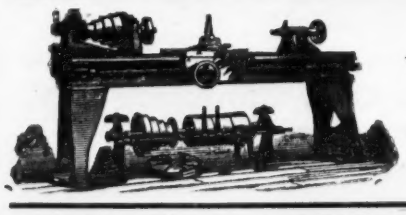

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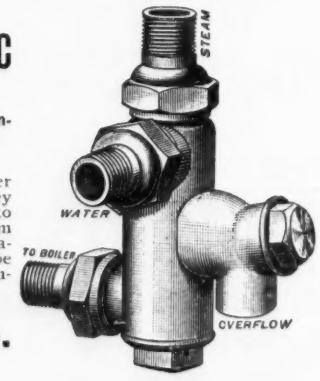

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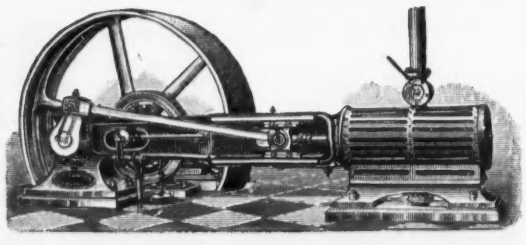

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